DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Electro-Voice Site
Buchanan, Michigan

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Electro-Voice, Inc. (EV), site developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based upon the contents of the Administrative Record for the EV site.

The State of Michigan concurs on the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

DESCRIPTION OF SELECTED REMEDY

This operable unit is the first of two operable units for the site. The first operable unit addresses remediation of on-property groundwater and soil contamination by eliminating or reducing the risks posed by the site through treatment of the source of groundwater contamination, the dry well area soils, treatment of on-property groundwater, monitoring off-property groundwater, and engineering and institutional controls.

The major components of the selected remedy include:

* Evaluate and determine the existence of a separate lower aquifer and any impact the EV site may have on it.

* Deed restrictions on the EV property to prohibit installation of drinking water wells and prohibit construction in the lagoon area and dry well area if cleanup levels are not attained. Deed restrictions on properties under which the EV plume travels to prohibit installation of drinking water wells.

* Soil Vapor Extraction (SVE) for 2 to 5 years followed by excavation, solidification and landfilling of the dry well area sludge layer.

* If after treatment and excavation the dry well area soils do not meet the cleanup standards established pursuant to Michigan's Act 307 Type B criteria, U.S. EPA will consider further remedial action consistent with RCRA.

* Install and maintain a hazardous waste cap meeting the substantive requirements of Michigan's Act 64 over the lagoon area soils.

* Install and maintain a groundwater collection and treatment system capable of capturing all contaminated groundwater located beneath the EV property boundary. Groundwater will be actively remediated until it meets Michigan's Act 307 Type B cleanup standards.

* Discharge of treated groundwater will be to the Publicly Owned Treatment Works (POTW).

* Monitor off-property groundwater.

DECLARATION

The selected remedy for the first operable unit is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable given the limited scope of the action. Because this action does not constitute the final remedy for the site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element will be addressed at the time of the final response action. Subsequent actions are planned to address fully the off-property groundwater at this site.

David A. Ullrich

for Valdas V. Adamkus
Regional Administrator
U.S. EPA - Region V

June 23, 1992
Date

RECORD OF DECISION

DECISION SUMMARY

ELECTRO-VOICE SITE

SOURCE CONTROL OPERABLE UNIT

BUCHANAN, MICHIGAN

Prepared By:

U.S. Environmental Protection Agency

Region V

Chicago, Illinois

June, 1992

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I. SITE LOCATION AND DESCRIPTION

Electro-Voice, Inc. ("EV"), is located at 600 Cecil Street in the City of Buchanan, Berrien County, Michigan, and is a manufacturer of audio equipment. Current activities at the facility include painting, electroplating, assembly, die casting and machining. EV has been in operation at its present location since 1946.

The site consists of the Electro-Voice building and parking area, a former dry well area where disposal of paint wastes occurred, a former lagoon area where disposal of electroplating wastewaters occurred, a former fuel tank area and a groundwater contaminant plume which extends from the EV property boundary one-half mile north to McCoy Creek. Groundwater contamination has been determined to extend from the Electro-Voice property to McCoy Creek, which is located approximately one-half mile north of the EV property (downgradient). See Figures 1 and 2.

The population of Buchanan in 1980 was approximately 5,142. The EV property is surrounded on three sides by residential homes and on the fourth side by an elementary school. All residents are connected to the city water supply. The city wells are located approximately 4,000 feet west of the EV property and are not considered to be threatened by the EV contaminant plume, as groundwater flow is to the north. The city water supply wells are screened from 20 to 44 feet below grade and are screened in the same aquifer in which the EV contaminant plume exists. The city's water supply is tested annually for volatile organic compounds (VOCs), and according to a city official, has never tested positive for VOCs.

McCoy Creek is the nearest surface water body and is located approximately 2,000 feet north of the EV facility. The Creek has an average depth of 2 feet, average width of 12 feet, and average velocity of 0.66 feet per second. McCoy Creek discharges into the St. Joseph River. Other surface water bodies in the vicinity of the EV property consist of ponds associated with gravel-pit operations, and several small unnamed lakes and ponds southeast of the property.

There are no rare or endangered species known to be resident at the EV site, nor are there species of special economic or recreational value for which the EV site serves as critical habitat. McCoy Creek is designated as a protected trout stream by the Michigan Department of Natural Resources ("MDNR"). Brown trout are stocked by MDNR at locations upstream from the City of Buchanan. There are no known wetlands in the immediate vicinity of the EV property.

The study area is covered with soils of the Oshtemo series. These soils are formed on glacial outwash plains and moraines and are described as well-drained sandy loams. Permeability is

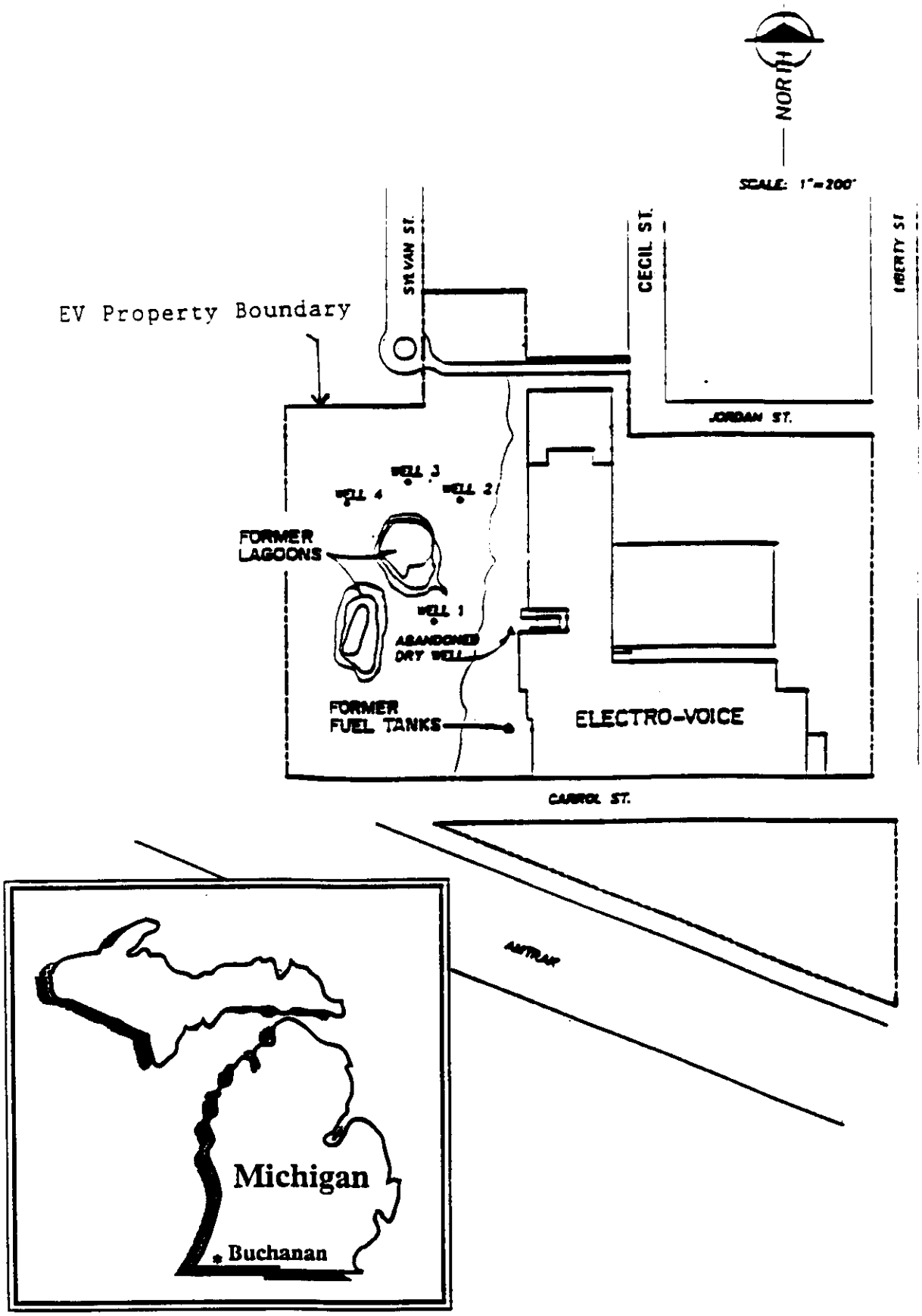
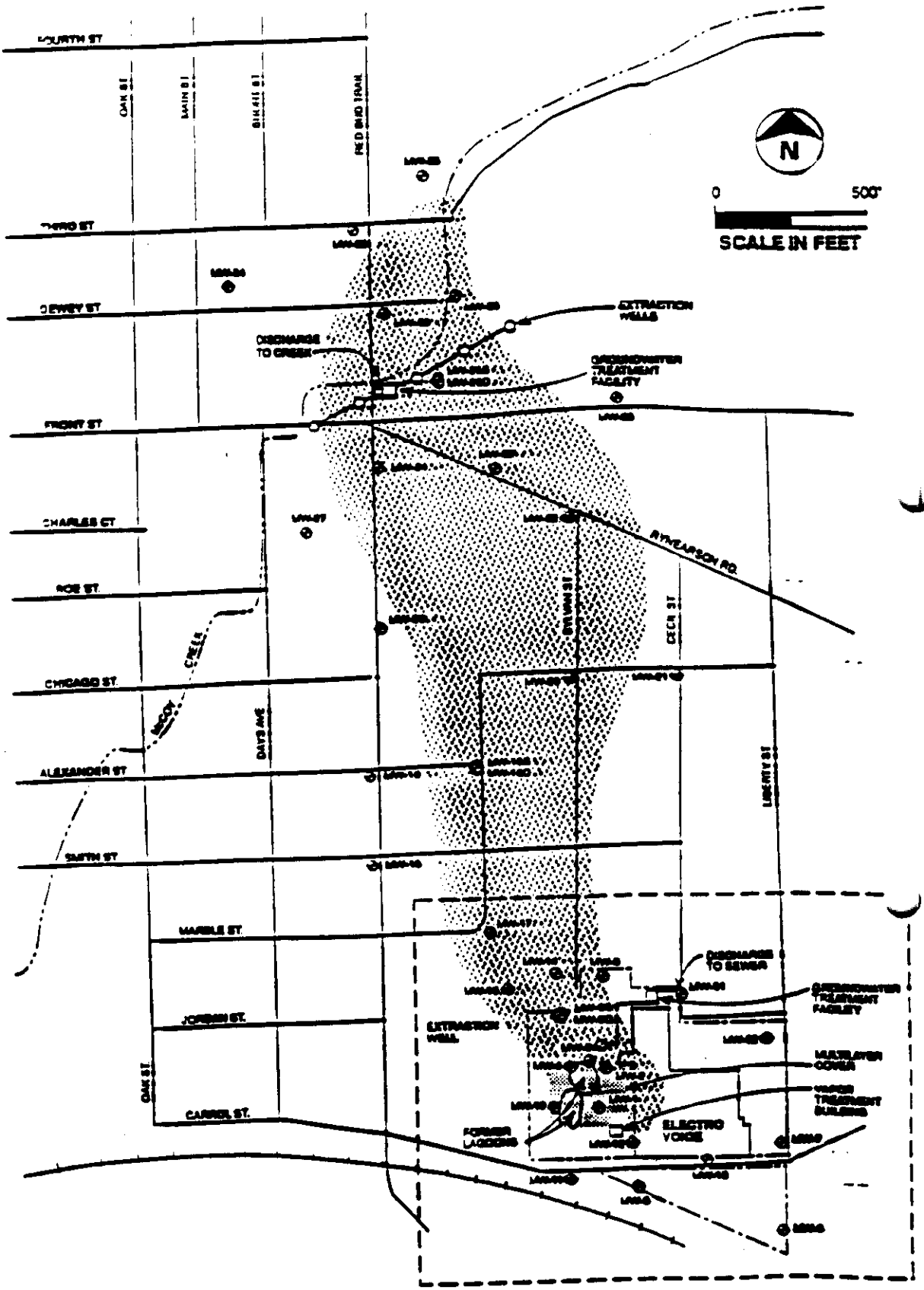


FIGURE 1
EV PROPERTY MAP

SOURCE: Figure 1-4, *Electro-Voice FS*.



LEGEND

Contaminated Groundwater Plume

FIGURE 2
SITE MAP

moderately rapid in the upper part of the subsoil and very rapid in the lower part. The study area generally consists of two geological units: an outwash, sand and gravel unit, underlain by a clay-rich-till unit. The upper portion of the outwash unit is unsaturated and the lower portion comprises an unconfined aquifer. Drillers' logs of the region indicate that a lower-confined aquifer also exists in localized areas. In the areas where both aquifers exist, they are separated by a clay-rich-confining layer.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

In 1952, EV constructed two clay-lined lagoons (north and south) for disposal of liquid waste from the electroplating operation at the plant. The north lagoon was the primary discharge lagoon. The north lagoon was approximately 50 feet in diameter and 11 feet deep with very steep side slopes. EV discharged plating waste to the north lagoon from 1952 to 1962. Information supplied by plant personnel indicates that this lagoon was continuously filled with standing water. A 12-inch-diameter pipe served as an overflow to the south lagoon. The south lagoon was approximately 40 feet by 75 feet in area and 10 feet deep. Use of these lagoons was discontinued in 1962, due to the installation of a new wastewater treatment facility in the EV building.

With the installation of a new automated painting system in 1964, a dry well was installed for disposal of wastes produced during painting operations. The dry well consisted of a hole in the ground which was backfilled with gravel. A gravity drain pipe connected a sink inside the building to the dry well. The sink was used to clean equipment associated with the paint shop. Liquid waste disposal in the sink reportedly included cleaning solvents (toluene, xylene, 2-butanone (MEK) and chlorinated solvents) and residual paint used in the manufacturing operations. The dry well was reportedly in use from 1964 to 1973.

In 1973, a subsurface tank (20,000-gallon capacity) was installed immediately west of the dry well to collect discharge from the paint shop. In 1975, the subsurface tank was removed and replaced with an upright buried tank of similar capacity. The second tank was removed in 1983. An aboveground tank, with a capacity of 1,000 gallons, was placed near the dry well and was identified as the MEK tank. The MEK tank has also been removed from the site.

Two partially buried fuel-oil tanks were excavated and removed from the site during July 1987. These tanks had been onsite since 1930. EV used the tanks from 1946 to 1960 for storage of No. 6 fuel oil.

In March 1979, plating waste solution was released into the north lagoon as a result of a ruptured drain pipe. EV reported this incident to the MDNR, which began an investigation of the site shortly after the incident was reported. The MDNR requested a review of onsite plating waste treatment and conducted an inspection of the EV property in March 1979.

In 1979, EV hired a contractor to develop a program for removal and abandonment of the two lagoons. In January 1980, four groundwater monitoring wells were installed around the lagoons to determine if liquid waste had leaked from the lagoons, thereby contaminating groundwater in the area. Groundwater samples collected in January 1980 contained detectable concentrations of xylene, toluene and lead.

In September 1980, the north lagoon and its contents were removed. The area was then backfilled. The south lagoon was merely backfilled (no contaminated materials were removed) and leveled to the natural surface topography of the area.

On July 29, 1982, a Hazard Ranking System (HRS) score was developed for the EV site. On September 8, 1983, the EV site was proposed for inclusion on the National Priority List (NPL), and the proposal became final on November 21, 1984 (49 Fed.Reg. 185).

In October 1987, EV entered into an Administrative Order by Consent to conduct the Remedial Investigation and Feasibility Study at the EV site.

III. COMMUNITY RELATIONS ACTIVITIES

A Community Relations Plan for the EV site was finalized in March 1989. This document lists contacts and interested parties throughout government and the local community. It also establishes communication pathways to ensure timely dissemination of pertinent information. A fact sheet outlining the Remedial Investigation (RI) sampling program was distributed to interested parties in February 1991. U.S. EPA held a public meeting in Buchanan, Michigan on February 28, 1991, to explain the results of the RI. U.S. EPA was informed by the public at the public meeting on February 28, 1991, that children were regularly playing in the former lagoon area on the EV property. In response to this information, U.S. EPA collected five surface soil samples from the lagoon area soils. The samples were analyzed for arsenic, lead and cadmium. The levels of cadmium in the surface soils exceeded the recommended levels for residential backyard soils. U.S. EPA requested that EV construct a fence around these soils immediately to discourage children from trespassing on them. EV complied with this request. U.S. EPA held an availability session in Buchanan on May 14, 1991, to discuss the lagoon area soil sampling results and any other health concerns the public had.

U.S. EPA and MDNR notified the local community, by way of the Proposed Plan, of the recommendation of a remedial alternative for the EV site. To encourage public participation in the selection of a remedial alternative, U.S. EPA and MDNR scheduled a public comment period from October 1, 1991, to November 29, 1991. At the request of the Buchanan City Manager, the public comment period was extended to December 13, 1991.

U.S. EPA and MDNR held two public meetings in Buchanan, Michigan, on October 30, 1991, and November 14, 1991, to discuss the recommended remedial alternatives and the other alternatives identified and evaluated in the Feasibility Study (FS). Transcripts of these meetings are included as part of the Administrative Record for the EV site.

A significant change has been made in the remedy selected for the EV site since the publication of the FS and the Proposed Plan in September 1991. The remedy recommended in the Proposed Plan was Alternative 4A: institutional controls; soil vapor extraction of dry well area soils followed by excavation and landfilling of remaining sludge layer; Michigan's Act 64 cap on the lagoon area soils; pump and treat all on- and off-property contaminated groundwater. Since publishing the Proposed Plan, U.S. EPA has determined that an operable unit approach is more appropriate for this site than selection of a final remedy at this time. The Agency's decision to utilize an operable unit approach was made after considering the substantial number of public comments which preferred monitoring the off-property groundwater rather than actively remediating the off-property groundwater through pump and treat. U.S. EPA has determined that the operable unit approach is more appropriate at this time because it allows a more focused, logical approach, whereby the contaminated soils, which are the source of groundwater contamination, and the more highly contaminated groundwater, the on-property groundwater, are treated first. The treatability study is required under this first operable unit ROD. U.S. EPA will evaluate the effect of a treatability study on soils and on-property groundwater prior to making a final remedy decision for the off-property groundwater in the second operable unit ROD.

U.S. EPA's responses to comments received during the public meeting and to written comments received during the public comment period are included in the Responsiveness Summary which is attached to this ROD. This decision document presents the selected remedial action for the first operable unit for the EV site in Buchanan, Michigan, chosen in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the NCP. The decision for this site is based on the Administrative Record.

All comments which were received by U.S. EPA prior to the end of the public comment period, including those expressed verbally at the public meeting, are addressed in the Responsiveness Summary

which is attached to this ROD.

IV. SCOPE AND ROLE OF THE ACTION

This ROD addresses the first of two operable units for the EV site and consists of treatment and excavation of the dry well area soils, closure of the lagoon area soils, treatment of the on-property groundwater and monitoring of the off-property groundwater. The threats posed by this site to human health and the environment are future residential use of contaminated groundwater (both on- and off-property), and future residential use of the lagoon area soils. The dry well area soils are the principal threat at the site because they are the source of groundwater contamination.

These threats will be addressed through the selected cleanup action, which includes:

Lower Aquifer Investigation

* Determine whether a lower aquifer exists below the clay till in the area of the dry well area soils, and ensure that no contamination from the EV site has entered the lower aquifer, if it exists.

Dry Well Area Soils

* soil vapor extraction
* excavation, solidification and landfilling of sludge layer
* closure, if cleanup standards cannot be met with SVE and excavation

Lagoon Area Soils

* determination of the extent of contamination
* capping of contaminated soils with a hazardous waste cover pursuant to Michigan Act 64

Groundwater

* pump and treat on-property groundwater with discharge to a publicly-owned treatment works (POTW)
* monitor off-property groundwater.

NOTE: The term "on-property groundwater" means all contaminated groundwater located under the EV property; "off-property groundwater" means the portion of the contaminated groundwater plume which was identified during the Remedial Investigation, extending from the EV property boundary approximately one-half mile north to McCoy Creek (see Figure 2, site map).

V. SUMMARY OF SITE CHARACTERISTICS

The purpose of a Remedial Investigation (RI) at a Superfund site is to characterize the nature and extent of contamination and associated risks posed by hazardous substances at a site. The objective of an RI is not to remove all uncertainty, but rather to gather information sufficient to support an informed risk management decision regarding which remedy appears to be the most appropriate for a given site.

The RI performed at the EV site was designed to determine the nature and extent of site contamination through a program of soil, groundwater and surface water sampling. Site geology and ground water flow patterns also were examined during the study.

Analysis of groundwater indicated the presence of eleven VOCs and two inorganic compounds. Maximum Contaminant Levels (MCLs), established by the Federal Safe Drinking Water Act, were exceeded in on-property groundwater for vinyl chloride, benzene, ethylbenzene, and toluene. Off-property groundwater consists of the groundwater contaminant plume which extends from the EV property boundary, approximately 2,000 feet north to McCoy Creek. Off-property groundwater exceeded MCLs for trichloroethylene and vinyl chloride. Contaminants detected in groundwater during the RI are presented in Table 1.

Fuel tank area soils indicated five VOCs in concentrations considered to be too low to pose a threat to human health and the environment.

Three out of five surface water samples from McCoy Creek showed levels of 0.6 ug/l of trichlorethylene, which is below the Michigan ambient water quality criteria (AWQC) of 94 ug/l.

The population within the study area is presently utilizing city water for domestic uses. The City's groundwater wells are not considered to be threatened by the EV plume, although they are located in the same aquifer.

Analysis of dry well area soils indicated the presence of nine VOCs, twenty-six semi-volatile compounds (SVOCs), and fifteen inorganic compounds above background levels.

Analysis of north lagoon area soils indicated the presence of two VOCs, five SVOCs, and thirteen inorganic compounds above background levels. Analysis of south lagoon area soils indicated the presence of three VOCs, ten SVOCs and seventeen inorganic compounds above background levels.

Contaminants detected in soils are presented in Table 2.

TABLE 1

CHEMICALS DETECTED IN GROUNDWATER

Chemical	Frequency of Detection: Overall	Frequency of Detection: Above MCL	Range of Sample Quantitation Limits (µg/L)	Range of Detected Concentrations (µg/L)	Background Levels (µg/L)
VOLATILES					
Acetone	7/48	NA	10 - 670	4 - 860	4 - 13
Benzene*	3/48	2	5	3 - 54	ND
Bromodichloromethane	3/48	NA	5 - 330	2 - 4	ND
2-Butanone*	2/48	NA	10	790 - 890	ND
Carbon disulfide	1/48	NA	5 - 330	1	ND
Chloroethane*	4/48	NA	10 - 670	1 - 31	ND
Chloroform	7/48	NA	5 - 330	2 - 8	ND
Chloromethane*	1/48	NA	10 - 670	10	ND
1,1-Dichloroethane*	5/48	NA	5	3 - 300	ND
1,2-Dichloroethane*	3/48	1	5 - 330	2 - 24	ND
1,1-Dichloroethene	1/48	NA	5 - 330	1	ND
1,2-Dichloroethene (total)*	13/48	1	5	1 - 120	ND
Dibromochloromethane	5/48	NA	5 - 330	2 - 3	ND
Ethylbenzene*	4/48	2	5	1 - 2,400	ND
4-Methyl-2-Pentanone	1/48	NA	10 - 670	27	ND
Methylene chloride	29/48	NA	5 - 330	1 - 6	1 - 6
Toluene*	4/48	2	5	1 - 10,000	ND
1,1,1-Trichloroethane*	3/48	0	5 - 50	7 - 35	ND
Trichloroethene*	14/48	11	5 - 330	1 - 76	ND
Trichloroethylene*	1/48	NA	ND	13	ND
Vinyl chloride*	4/48	5	10 - 100	5 - 72	ND
Xylenes (total)*	3/48	0	5	3 - 8,800	ND
SEMI-VOLATILES					
Benzoic acid*	1/48	NA	50 - 56	200	ND
bis(2-ethylhexyl)phthalate*	10/48	NA	10 - 11	5 - 10	10 - 48
2,4-Dimethylphenol*	1/48	NA	10 - 11	8	ND
2-Methylphenol*	1/48	NA	10 - 11	10	ND
4-Methylphenol*	1/48	NA	10 - 11	54	ND
Napthalene*	1/48	NA	10 - 11	130	ND
METALS					
Aluminum	4/48	1	23 - 27	25 - 54.5	26 - 69.9
Antimony	1/48	NA	33 - 50.2	20.9	ND
Arsenic	1/48	0	1.6 - 2.2	3.8	2.3 - 13
Barium	7/48	0	NA	44 - 162	46 - 297
Beryllium	1/48	NA	0.29 - 0.7	5.7	0.74 - 9.4
Cadmium	1/48	0	4 - 4.4	12.6	12.4
Calcium	7/48	NA	NA	54,800 - 124,000	90,300 - 1,040,000

Table 1 (cont.)

Chemical	Frequency of Detection: Overall	Frequency of Detection: Above MCL	Range of Sample Quantitation Limits (µg/L)	Range of Detected Concentrations (µg/L)	Background Levels (µg/L)
Chromium	1/48	0	6.2 - 8.1	8.9	8.9
Cobalt	2/48	NA	2.6 - 3.9	6.7 - 7.4	3.3 - 24.9
Copper	5/48	0	3.1 - 7.2	10.2 - 15.5	11.6 - 26
Iron	14/48	5	3.7 - 5	4.1 - 25,600	31.1 - 25,600
Lead	2/48	NA	0.91 - 1.1	2.6 - 9.7	2.6
Magnesium	7/48	NA	NA	22,200 - 46,000	38,000 - 51,600
Manganese	13/48	4	NA	11.3 - 673	4.2 - 502
Mercury	1/48	0	0.20	0.2	ND
Nickel	1/48	0	34 - 35.8	38	ND
Potassium	6/48	NA	1,770 - 2,020	1,610 - 9,780	4,710 - 10,200
Selenium	0/48	NA	3.2 - 10	ND	ND
Silver	0/48	NA	5.7 - 9.4	ND	ND
Sodium	7/48	NA	NA	7,670 - 264,000	8,370 - 26,700
Thallium	0/48	NA	1.3 - 2	ND	ND
Vanadium	4/48	NA	NA	3.4 - 10.9	4.8 - 25.6
Zinc	7/48	0	2.6	35.4 - 575	69 - 1,080
INORGANICS					
Cyanide	4/48	NA	10	14 - 2,070	14 - 2,070

[EH]EV2900:D2917, 81203, PM-21

NA = Not available.
ND = Not detected.
MCL = Safe drinking water at maximum contaminant level.

*Chemicals of potential concern.

Source: Ecology and Environment, Inc. 1990.

TABLE 2

CHEMICALS DETECTED IN SOILS

Chemical	Frequency of Detection	Range of Sample Quantitation Limits (µg/kg)	Range of Detected Concentrations (µg/kg)	Background Levels (µg/kg)
VOLATILES				
Acetone	17/25	10 - 24,000	11 - 3,800	ND
Benzene*	1/25	5 - 12,000	1,600	ND
2-Butanone*	3/25	10 - 24,000	560 - 4,900	ND
Chloroform	4/25	5 - 12,000	1 - 3	1 - 2
1,1-Dichloroethane*	4/25	5 - 12,000	4 - 200	ND
1,2-Dichloroethene (total)*	5/25	5 - 12,000	1 - 200	ND
Ethylbenzene*	8/25	5 - 630	11 - 99,000	ND
4-Methyl-2-Pentanone	1/25	10 - 24,000	4	ND
Methylene chloride	24/25	NA	4 - 4,000	ND
Styrene	1/25	5 - 12,000	3,400	ND
Tetrachloroethene*	5/25	5 - 630	1 - 14,000	ND
Toluene*	6/25	5 - 640	2 - 330,000	ND
1,1,1-Trichloroethane*	5/25	5 - 12,000	170 - 6,200	ND
Trichloroethene*	10/25	5 - 12,000	2 - 420	ND
Xylenes (total)*	9/25	5 - 6	4 - 710,000	ND
SEMI-VOLATILES				
Acenaphthene*	1/15	340 - 1,500	170	ND
Acenaphthylene*	1/15	340 - 1,500	120	ND
Anthracene*	1/15	340 - 1,500	200	ND
Benzo(a)anthracene*	1/15	340 - 1,500	650	ND
Benzo(k)fluoranthene*	3/15	340 - 1,500	39 - 2,000	ND
Benzo(b)fluoranthene*	3/15	340 - 1,500	39 - 2,000	ND
Benzo(a)pyrene*	1/15	340 - 1,500	910	ND
Benzo(g,h,i)perylene*	1/15	340 - 1,500	370	ND
Benzoic acid*	1/15	1,600 - 7,300	64	ND
Benzyl alcohol*	1/15	340 - 1,500	48	ND
bis(2-ethylhexyl)phthalate*	8/15	340 - 1,500	13,500 - 14,000	ND
Butyl benzyl phthalate*	1/15	340 - 1,500	120	ND
Chrysene*	2/15	340 - 1,500	45 - 630	ND
Dibenzo(a,h)anthracene*	1/15	340 - 1,500	150	ND
Dibenzofuran*	1/15	340 - 1,500	440	ND
Di-n-butyl phthalate*	3/15	340 - 1,500	150	ND
1,2-Dichlorobenzene*	1/15	340 - 1,500	94	ND
2,4-Dimethylphenol*	1/15	340 - 1,500	530	ND
Di-n-octyl phthalate	1/15	340 - 1,500	430	ND
Fluoranthene*	3/15	340 - 1,500	84 - 1,800	ND
Fluorene	1/15	340 - 1,500	710	ND
Indeno(1,2,3-cd)pyrene*	1/15	340 - 1,500	340	ND
2-Methylnaphthalene*	4/15	340 - 1,500	77 - 1,300	ND
2-Methylphenol*	2/15	340 - 1,500	620 - 640	ND
4-Methylphenol*	1/15	340 - 1,500	610	ND
Naphthalene*	4/15	340 - 1,500	11,000 - 14,000	ND
Phenanthrene*	3/15	340 - 1,500	54 - 1,400	ND
Pyrene*	4/15	340 - 1,500	50 - 1,100	ND
1,2,4-Trichlorobenzene	1/15	340 - 1,500	73	ND

(EM)EV2900:D2917, :1204, PMw15

Table 2 (cont.)

Chemicals	Frequency of Detection	Range of Sample Quantitation Limits (µg/kg)	Range of Detected Concentrations (µg/kg)	Background Levels (µg/kg)
METALS				
Aluminum	11/11	NA	1,100 - 6,520	2,880 - 3,300
Antimony	4/11	7.0 - 8.3	6.8 - 9.1	ND
Arsenic*	11/11	NA	1.5 - 14	2.8 - 4.7
Barium*	11/11	NA	4.8 - 89	12 - 13
Beryllium	8/11	0.061 - 0.73	0.19 - 0.46	0.38 - 0.40
Cadmium*	9/11	0.80 - 0.81	0.85 - 735	ND
Calcium	11/11	NA	828 - 97,900	531 - 4,100
Chromium*	11/11	NA	3.5 - 1,340	5.5 - 8.4
Cobalt	11/11	NA	2.3 - 5.3	2.1 - 6.1
Copper*	11/11	NA	7.3 - 152	10 - 15
Iron	11/11	NA	4,470 - 15,600	6,230 - 12,700
Lead*	11/11	NA	4.6 - 83	5.4 - 15
Magnesium	11/11	NA	993 - 39,600	816 - 3,060
Manganese	11/11	NA	225 - 518	196 - 721
Mercury	1/11	0.10 - 0.11	0.69	ND
Nickel*	10/11	6.5 - 6.9	7.1 - 133	8.1 - 17
Potassium	7/11	359 - 446	419 - 1,280	729
Selenium	0/11	0.45 - 4.5	ND	ND
Silver	1/11	1.9 - 2.4	77	ND
Sodium	11/11	NA	216 - 1,010	220 - 243
Thallium	2/11	0.38 - 0.47	0.4 - 0.42	ND
Vanadium	11/11	NA	5 - 16	8.4 - 10
Zinc	11/11	NA	31 - 999	40 - 77
INORGANICS				
Cyanide	5/11	0.51 - 0.57	7.5 - 24	ND

(EM1EV2900:D2917, 41204, PM=15

ND = Not detected.
NA = Not available.

*Chemicals of potential concern.

Source: Ecology and Environment, Inc. 1990.

VI. SUMMARY OF SITE RISKS

A baseline risk assessment (RA) was conducted for the EV site in accordance with the guidance provided in U.S. EPA's Risk Assessment Guidance for Superfund (RAGs): Volume I, Human Health Evaluation Manual and risk assessment guidelines developed by the State of Michigan. The RA for the EV site is presented in two documents entitled "Risk Assessment for the Electro-Voice Site," September 1990, and "Supplemental Risk Assessment for the Electro-Voice Site," March 1991. The baseline RA consists of an identification of chemicals of concern, toxicity assessment, exposure assessment, risk characterization and ecological assessment. The baseline RA assumes no corrective action will take place and that no site-use restrictions will be imposed. The RA then determines actual or potential risks or toxic effects that the chemical contaminants at the site pose under current and future land use assumptions.

The off-property portion of the groundwater plume of contamination moves for a half mile under residential and city property before it discharges to McCoy Creek. Therefore, exposures based on drinking and dermal absorption were used to estimate the risks posed by the groundwater. The source of hazardous substance contamination of the groundwater are the dry well area soils at the EV property. The property owned by EV is currently used for industrial purposes; however, the property is bounded on the north, south and west by residences. The east side is bounded by an elementary school. Therefore, exposures based on reasonable future residential land use are appropriate to estimate the risks posed by the source areas.

MCLs were exceeded in on-property groundwater for vinyl chloride, benzene, ethylbenzene, and toluene. Off-property groundwater exceeded MCLs for trichloroethylene and vinyl chloride.

A. Contaminants of Concern

Contaminants of concern are detected contaminants which have inherent toxic/carcinogenic effects that are likely to pose the greatest concern with respect to the protection of public health and the environment. Selected contaminants of concern, for the purpose of the RA at the EV site, are presented in Table 3.

B. Toxicity Assessment

The purpose of the toxicity assessment is to develop human health and environmental receptor toxicity and carcinogenicity data for the chemicals of concern at the site and to provide an estimate of the relationship between the extent of exposure to a contaminant and the likelihood and/or severity of adverse effects. The toxicity assessment is accomplished in two steps--hazard identification and dose-response assessment.

TABLE 3

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN

Chemical	Concentrations	
	Soils (µg/kg)	Groundwater (µg/L)
VOLATILES		
Benzene	1,600	3 - 54
Chloroethane	ND	1 - 31
Chloromethane	ND	10
1,1-Dichloroethane	4 - 6	3 - 300
1,2-Dichloroethane	ND	2 - 24
1,2-Dichloroethene (total)	1 - 4	1 - 120
Ethylbenzene	11 - 95,000	1 - 2,400
2-Butanone	560 - 4,900	790 - 490
Styrene	3,400	ND
1,1,1-Trichloroethane	170 - 6,200	7 - 35
Tetrachloroethene	1 - 14,000	ND
Toluene	2 - 330,000	1 - 10,000
Trichloroethene	2 - 420	1 - 76
Vinyl chloride	ND	5 - 72
Xylenes (total)	4 - 710,000	3 - 6,800
SEMI-VOLATILES		
Acenaphthene	170	ND
Acenaphthylene	120	ND
Anthracene	200	ND
Benzo(a)anthracene	850	ND
Benzo(k)fluoranthene	39 - 2,000	ND
Benzo(b)fluoranthene	39 - 2,000	ND
Benzo(a)pyrene	910	ND
Benzo(g,h,i)perylene	370	ND
Benzoic acid	64	200
Benzyl alcohol	48	ND
bis(2-ethylhexyl)phthalate	13,500 - 14,000	5 - 10
Butyl benzyl phthalate	120	ND
Chrysene	45 - 430	ND
Dibenzo(a,h)anthracene	150	ND
Dibenzofuran	440	ND
Di-n-butyl phthalate	150	ND
2,4-Dimethylphenol	530	8
Di-n-octylphthalate	430	ND
Fluoranthene	84 - 1,800	ND
Indeno(1,2,3-cd)pyrene	340	ND
2-Methyl naphthalene	77 - 1,300	ND
2-Methylphenol	620 - 640	18
4-Methylphenol	618	54
Naphthalene	12,000 - 14,000	130
Phenanthrene	54 - 1,400	ND
Pyrene	50 - 1,100	ND
PCB-1254	375	ND
METALS		
Arsenic	1.5 - 14	3.0
Barium	4.8 - 49	44 - 162
Cadmium	0.85 - 735	12.4
Chromium	3.5 - 1,340	8.9
Copper	7.3 - 152	10.2 - 15.5
Lead	4.6 - 83	2.6 - 9.7
Nickel	7.1 - 133	38
Zinc	31 - 999	35.4 - 575
INORGANICS		
Cyanide	7.5 - 24	14 - 2,070

(EM)EV2900:D2917. #1206. PM=24

ND = Not detected.

The dose-response evaluation presents available human health and environmental criteria for the contaminants of concern, and relates the chemical exposure (dose) to expected adverse health effects (response). Included in this assessment are the pertinent standards, criteria, advisories and guidelines developed for the protection of human health and the environment. An explanation of how these values were derived and how they shall be applied is presented below.

Cancer potency factors (CPFs) have been developed by U.S. EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of (mg/kg/day)-1, are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassay to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by U.S. EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg/day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

C. Exposure Assessment and Risk Characterization

The exposure assessment identified potential pathways and routes for contaminants of concern to reach the receptors and the estimated contaminant concentration at the points of exposure.

The risk characterization quantifies present and/or potential future threats to human health that result from exposure to the contaminants of concern at the EV site.

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1x10-6 or 1E-6 or 0.000001). An excess lifetime cancer risk of 1x10-6 indicates that, as a plausible upper bound, an

individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. The U.S. EPA generally attempts to reduce the excess lifetime cancer risk posed by a Superfund site to a range of 1X10-4 to 1X10-6 (1 in 10,000 to 1 in 1 million), with an emphasis on the lower end, 1X10-6, of the scale.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. If the estimated non-carcinogenic risk is less than 1.0, no adverse effects are expected. If the calculated non-carcinogenic risk is greater than 1.0, adverse health risks are possible.

The EV current land use exposure scenarios and the calculated risk characterization associated with each exposure scenario are as follows:

1. Inhalation of vapors from dry well area soils to:
   a. on-site workers
   b. children trespassing
2. Workers at Front St. businesses, basement infiltration of groundwater vapors, inhalation exposure indoors.
3. Recreational fishermen using McCoy Creek, ingestion and dermal exposure to water, fish ingestion.
4. Children trespassers, exposure to lagoon area soils (ingestion, dermal and inhalation of vapors).
5. Child exposure to arsenic in dry well area soils (ingestion, dermal).

Scenario	Reasonable Max. Carcinogenic Risk	Reasonable Max. Non-carcinogenic Risk
1a	1 X 10-6	0.03
1b	1 X 10-7	0.03
2	8 X 10-7	0.0006
	5 X 10-4 (if VC detected in Groundwater at 5 ppb)	
3	3 X 10-8	0.000004
4	1 X 10-7	0.04
5	2 X 10-7	------

Note: bold numbers indicate risk is outside risk range set forth in the NCP

Scenario 2 indicates a possible adverse carcinogenic exposure. At the time the risk assessment was completed, no vinyl chloride had been detected in groundwater in the area where Front Street businesses are located. However, because the detection limit used was inadequate, vinyl chloride may be present at concentrations below its detection limit but high enough to still pose a significant health risk. To take this possibility into account, the risk assessor assumed that vinyl chloride was present at its qualitative detection limit (5 ppb). During a subsequent investigation of surface water, monitoring wells 26 (shallow), 28, 30 and 35 were sampled and analyzed for vinyl chloride at a detection limit of 1.5 ppb. Vinyl chloride was detected in monitoring well 30 at a concentration of 7 ppb; none of the other monitoring wells sampled showed vinyl chloride above the detection limit (1.5 ppb). Monitoring well 26 is located closest to Front Street.

The future residential land use exposure scenarios that were evaluated are as follows:

1. Residential use at dry well location (direct contact), outdoor soil exposures (ingestion, dermal, and inhalation of vapors).
2. Residential use at dry well location, infiltration of vapors, indoor inhalation only.
3. Residential use of groundwater for drinking and showering (ingestion and dermal).
4. Residential use of lagoon area soils (ingestion, dermal and inhalation of vapors indoors and outdoors).
5. Residential use at dry well location, exposure to arsenic (ingestion, dermal).

Scenario	Reasonable Max. Carcinogenic Risk	Reasonable Max. Non-carcinogenic Risk
1	5 X 10-5	0.6
2	1 X 10-5	0.2
3	**4 X 10-4**	**18.0**
4	1 X 10-5	**2.0**
5	4 X 10-6	-----

Note: bold numbers indicate risk is outside risk range set forth in the NCP

All of the future use scenarios indicate there is a low long-term carcinogenic threat. Scenarios 3 and 4 both indicate an unacceptable non-carcinogenic risk (greater than 1). The dry well area soils, although posing a low long-term threat, has been identified as the source of groundwater contamination.

The exposure assumptions used in the EV RA are in accordance with U.S. EPA's guidance document Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual (Part A), December 1989, and are as follows:

Scenario		Exposure Frequency	Exposure Duration
1 - ingestion	adult	365 days/yr	30 years
	child	365 days/yr	5 years
1 - dermal	adult	120 days/yr	30 years
	child	150 days/yr	5 years
1 - inhalation	adult	365 days/yr	30 years
	child	365 days/yr	5 years
2 - inhalation	adult	365 days/yr	30 years
	child	365 days/yr	5 years
3 - ingestion	adult	365 days/yr	30 years
	child	365 days/yr	5 years
4 - ingestion	adult	365 days/yr	30 years
	child	365 days/yr	5 years
4 - dermal	adult	120 days/yr	30 years
	child	150 days/yr	5 years
4 - inhalation	adult	365 days/yr	30 years
	child	365 days/yr	5 years

D. Ecological Assessment

An ecological assessment of the EV site was undertaken in order to identify any environmental resources at or near the site that might be adversely affected by site contaminants. An ecological assessment is a qualitative or quantitative appraisal of the actual or potential effects of hazardous waste site contaminants on plants and animals other than humans and domesticated species.

Organic and inorganic contamination in the dry well area, lagoon area and fuel tank area soils is not expected to result in adverse effects on terrestrial ecosystems due to the absence of stressed vegetation or stained soils at the site. At the time the ecological assessment was conducted, no surface soil sampling had been completed anywhere at the site. Surface soil sampling of lagoon area soils was subsequently conducted and confirmed that contamination of metals existed in surface soils as well as subsurface soils in this area.

Chlorinated hydrocarbons, alkylbenzenes, and low concentrations of several PAHs were found in groundwater near the former dry well area. Groundwater is located 30 to 50 feet below ground surface at the site and does not discharge to the site surface. Groundwater is therefore not expected to have any on-site ecological impacts. Groundwater does discharge to McCoy Creek approximately one-half mile north of the site. Surface water sampling of McCoy Creek indicated that contaminant levels from the EV plume in the Creek are below MCLs. Therefore it does not appear that contaminated groundwater entering McCoy Creek will adversely affect plants or animals which utilize McCoy Creek.

There are no rare or endangered species known to be resident at the EV site, nor are there species of special economic or recreational value for which the EV site serves as critical habitat.

U.S. EPA ambient water quality criteria (AWQC) for the protection of freshwater species are available for 1,2-DCE and TCE, which are designated chemicals of concern for the site. A computer database search was conducted to assess the toxicological effects of 1,2-DCE, TCE and vinyl chloride on aquatic flora and fauna. The search included the AQUIRE, PHYTOTOX, ENVIROLINE, BIOSDIS, POLLUTION, ABSTRACTS, and other data bases.

The quotient method was chosen as the methodologies for assessing risks to aquatic systems. The risk characterization results indicate that no significant effects on aquatic organisms are expected to result from groundwater contaminants discharged to McCoy Creek.

VII. ENVIRONMENTAL STANDARDS NOT MET AT THE SITE

In addition to posing unacceptable risks to receptors, the Electro-Voice site does not meet certain applicable or relevant and appropriate Federal or State environmental requirements (ARARs) at this time.

A. Groundwater

Table 4 lists the representative chemicals found in the contaminated groundwater plume and the corresponding Federal and State groundwater cleanup standards which the U.S. EPA believes to be adequately protective of human health and the environment. The off-property groundwater contains trichloroethene, 1,2-dichloroethene, and vinyl chloride. All other chemicals identified in the groundwater were detected only in the on-property groundwater. The groundwater contaminant plume contains concentrations of hazardous substances which exceed most of these groundwater standards and cleanup criteria.

TABLE 4
FEDERAL AND STATE GROUNDWATER CLEANUP STANDARDS

CHEMICAL CAS #	MCL/MCLG (ug/l)	MI ACT 307 TYPE B* (ug/l)
Volatile Organic Compounds		
Alkylbenzene	_____	20.00
Benzene 71-43-1	5/0	1.00
2-Butanone 78-93-3	-----	400.00
Chloroethane 75-00-3	-----	9.00
Chloromethane 74-87-3	-----	3.00
1,2-Dichloroethane (1,2-DCA) 107-06-2	5/0	0.40
1,1-Dichloroethene (1,1-DCE) 75-35-4	7/7	0.06
1,2-Dichloroethene (1,2-DCE)		
cis 156-59-2	70	70.00
trans 156-60-5	100	140.00
Ethyl Benzene 100-41-4	700/700	70.00
Toluene 108-88-3	1,000/1,000	800.00
1,1,1-Trichloroethane (1,1,1-TCA) 71-55-6	200/200	600.00
Trichloroethylene (TCE) 79-01-6	5/0	3.00
Vinyl Chloride 75-01-4	2/0	0.02
Xylenes (total) 1330-20-7	10,000/10,000	20.00
Semi-volatile organic compounds		
Bis(2-ethylhexy)phthalate 117-81-7	4/0+	2.50
Napthalene 91-20-3	-----	30.00

* Groundwater protection criteria.
+ proposed MCL and MCLG

The point of compliance for groundwater for cleanup purposes shall be throughout the on-property plume within the EV property (see Figure 1). This first operable unit addresses only the contaminated groundwater located within the EV property boundary. Groundwater cleanup standards (Michigan's Act 307 Type B standards, see Table 5 of this ROD) shall be applicable throughout the on-property contaminated groundwater. Groundwater background concentrations shall be required to be established during the remedial design.

Groundwater Protection Goals and the National Contingency Plan

The U.S. EPA's groundwater protection goal has been set forth in the NCP as follows:

The national goal of the remedy selection process is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste. Title 40 of the Code of Federal Regulations (40 CFR) Section 300.430(a)(1)(i).

The NCP states that the U.S. EPA expects to return usable ground waters to their beneficial uses, wherever practicable, within a time frame that is reasonable given the particular circumstances of the site. Whenever restoration of groundwaters is not practicable, U.S. EPA expects to prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction. 40 CFR Section 300.430(a)(1)(iii)(F).

U.S. EPA expects to use institutional controls such as water use and deed restrictions to supplement engineering controls as appropriate for short-and long-term management to prevent or limit exposure to hazardous substances, pollutants, or contaminants... The use of institutional controls shall not substitute for active response measures as the sole remedy unless such response measures are determined not to be practicable... 40 CFR Section 300.430(a)(1)(iii)(D).

State of Michigan Groundwater Protection Goals

Michigan Act 307 provides for remedial action, at contaminated sites within the State, which "shall be protective of the public health, safety, and welfare and the environment and natural resources." Additionally, all "remedial actions which address the remediation of an aquifer shall provide for removal of the hazardous substance or substances from the aquifer..." Michigan Act 307 also provides for the determination of acceptable criteria for groundwater remediation at the site.

Cleanup Standards

U.S. EPA's groundwater cleanup policy is to attain Maximum Contaminant Levels (MCLs) under the Federal Safe Drinking Water Act (SDWA); however, if cleanup to MCLs causes the residual risk levels to exceed the 1 X 10-4 to 1 X 10-6 risk range, then the U.S. EPA must apply risk-based cleanup levels to reach the goal of protectiveness (1 X 10-6 excess lifetime cancer risk).

Michigan Act 307 Rules contain clean-up criteria which include three different methods by which clean-up levels can be determined. The levels are Type A, Type B, and Type C. The methodology for Type A clean-up is based on background levels or method detection limits for chemicals of concern. The methodology for Type B clean-up uses standardized risk assumptions and exposure assumptions to determine clean-up levels which will be protective of human health and the environment and the use of the involved resource. Rules 299.5709 and 299.5711 of Michigan's Act 307 provide a thorough explanation on how to apply the Type B clean-up to the chemicals of concern and calculate the cleanup levels for the site. The methodology for Type C clean-up reviews the actual conditions of the site; the uses, present and future, of the site; a site specific risk assessment; and cost effectiveness analysis. Rule 299.5717 of Michigan's Act 307 provides a thorough explanation of how to apply the Type C clean-up to the chemicals of concern.

Michigan's Act 307, Type B clean-up criteria provide for the calculation of risk-based clean-up standards at the 1×10^{-6} excess lifetime cancer risk level for each carcinogenic compound. These standards are usually more stringent than the corresponding MCLs or non-zero Maximum Concentration Limit Goals (MCLGs). The U.S. EPA has determined that Michigan's Act 307, Type B criteria are protective and are applicable or relevant and appropriate to the EV site.

Table 5 lists the Groundwater Remediation Standards for the Electro-Voice site.

TABLE 5
GROUNDWATER CLEANUP STANDARDS FOR THE ELECTRO-VOICE SITE

CHEMICAL CAS #	(ug/l)
Alkylbenzene	20.00
Benzene 71-43-1	1.00
2-Butanone 78-93-3	400.00
Chloroethane 75-00-3	9.00
Chloromethane 74-87-3	3.00
1,2-Dichloroethane (1,2-DCA) 107-06-2	0.40
1,1-Dichloroethene (1,1-DCE) 75-35-4	0.06
1,2-Dichloroethene (1,2-DCE)	
cis 156-59-2	70.00
trans 156-60-5	140.00
Ethyl Benzene 100-41-4	70.00
Toluene 108-88-3	800.00
1,1,1-Trichloroethane (1,1,1-TCA) 71-55-6	600.00
Trichloroethylene (TCE) 79-01-6	3.00
Vinyl Chloride 75-01-4	0.02
Xylenes (total) 1330-20-7	20.00
Semi-volatile organic compounds	
Bis(2-ethylhexy)phthalate 117-81-7	2.50
Napthalene 91-20-3	30.00

NOTE: Table 5 is the more stringent standard of the standards presented in Table 4.

B. Dry Well Area Soils

Cleanup levels are developed in accordance with Michigan's Act 307 Type B criteria (aquifer protection criteria) or background, whichever is more stringent. U.S. EPA shall require establishment of background soil concentrations during the remedial design.

TABLE 6

CHEMICAL CAS #	MI ACT 307 TYPE B* (ug/kg)
Volatile Organic Compounds	
Alkanes	-----
Alkylbenzenes	-----
Benzene 71-43-1	20.0
Ethylbenzene 100-41-4	1,400.0
Styrene 100-42-5	20.0
Tetrachloroethene 127-18-4	14.0
Toluene 108-88-3	16,000.0
Trichloroethylene 79-01-6	60.0
Xylenes 1330-20-7	6,000.0
Semi-volatile Organic Compounds	
benzo(a)anthracene 56-55-3	100.0
benzo(k)fluoranthene 207-08-9	100.0
benzo(b)fluoranthene 205-99-2	100.0
benzo(a)pyrene 50-32-8	100.0
benzo(ghi)perlyene 191-24-2	100.0
Bis(2-ethylhexy)phthalate 117-81-7	40.0
Chrysene 218-01-9	100.0
dibenzo(a,h)anthracene 53-70-3	100.0
ideno[1,2,3-cd]pyrene 193-39-5	100.0
Napthalene 91-20-3	600.0

TABLE 6 (continued)

CHEMICAL CAS #	MI ACT 307 TYPE B* (ug/kg)
PCB	
PCB 1254 11097-69-1	1,000.0
Metals	
Arsenic	0.4+
Beryllium	0.8+

* Groundwater protection criteria.
+ Local background levels will be used as the cleanup standard if they are more stringent than Type B criteria.

C. Lagoon Area Soils

During remedial design, and prior to capping of the lagoon area soils, the horizontal and vertical extent of contamination shall be determined.

A Type C remedy developed pursuant to Michigan's Act 307 Rules has been determined to be relevant and appropriate for the lagoon area soils because these soils are located in a natural depression, and therefore are an unlikely area for future development. However, children may trespass and play in this area, both currently and in the future. The cap shall be designed in accordance with the State of Michigan's hazardous waste rules, Michigan's Act 64. A hazardous waste cap shall eliminate or decrease dermal contact and ingestion of lagoon area soils. The hazardous waste cap will also eliminate or decrease infiltration into the soils, thereby decreasing the mobility of cadmium, which was present at elevated levels in the lagoon area soils and was detected above background levels in the soil column at 26 feet deep (groundwater table is at 29.5 feet deep). Cadmium is one of the more mobile metals, and may pose a threat to groundwater in the future. See Figure 3.

D. Rationale for Further Action

Actual or threatened releases of hazardous substances from this site, if not addressed by implementation of the response action selected by this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment. Therefore, based on the findings in the RI report and the discussion above, a Feasibility Study (FS) was performed to focus the development of alternatives to address the threats at the site. The FS report documents the evaluation of the magnitude of site risks, site-specific applicable or relevant and appropriate requirements, and the requirements of CERCLA and the NCP, especially the groundwater protection policy, in the derivation of remedial alternatives for the EV site.

VIII. SUMMARY OF ALTERNATIVES

The principal objective of remedial action is to eliminate and/or reduce the threat or potential threat to human health and the environment posed by the areas of concern. The selection process for remedial actions is developed to address the specific threat posed in an area of concern, and considers the chemicals of concern and the routes of exposure, as well as effective technologies to address them.

The alternatives analyzed for the site are presented below. All of the alternatives except the No Action Alternative include a limited investigation for a lower aquifer. The purpose of the lower aquifer investigation is to determine if a second aquifer exists below the clay till layer in the vicinity of the dry well area and if so, if that aquifer has been impacted by contaminants from the EV site.

The estimation of groundwater cleanup times as presented in the Feasibility Study (FS) report assumes that relative decrease in contaminant mass (or concentration) with each pore volume is constant. In other words, for each pore volume, the same ratio of mass is removed from the system, but the total mass removed by each successive pore volume is less. This constant reduction in contaminant mass can be described by the first order exponential decay equation used in the FS.

Alternative 1: "No Action"

The NCP requires that a "No Action" Alternative be considered at every site. It is used as a basis for comparison during the evaluation of other alternatives. The "No Action" Alternative assumes that no active remediation shall be conducted to address potential public health and environmental problems.

Years to Attain Groundwater Cleanup Standards: 100+ years
Capital Cost: $0
Annual Operation and Maintenance (O&M) Cost: $0
Present Net Worth (over 30 years): $0

Alternative 2: Institutional controls; impermeable cap over all contaminated soils.

As a component to this Alternative, institutional controls shall require placement of deed restrictions on property and site monitoring. Deed restrictions shall restrict future excavation on the EV property and restrict groundwater usage throughout the contaminant plume. Site monitoring shall include site inspections and groundwater monitoring. The inspection program shall include inspecting the fence for damage and monitoring for any signs of trespassing. Groundwater monitoring shall track the long-term aquifer quality through sampling.

A clay cap that shall meet the requirements of Michigan's Act 64 (a minimum of 3 feet of compacted clay, with 2 feet of additional material including a vegetative layer) over the dry well area and lagoon area soils shall ensure long term effectiveness and permanence of protection of human health and the environment. The Resource Conservation and Recovery Act (RCRA) Subtitle C and Michigan Act 64 are not applicable because the wastes in the lagoon area soils are not RCRA listed wastes. RCRA Subtitle C and Michigan ("MI") Act 64 have been determined to be relevant and appropriate. RCRA Subtitle C/MI Act 64 are relevant because the wastes which were disposed in the former lagoons are sufficiently similar to RCRA listed wastes F006, F007 and/or F008. RCRA Subtitle C/MI Act 64 are appropriate because capping with a RCRA Subtitle C/MI Act 64 hazardous waste cap shall address the following concerns: a hazardous waste cap shall provide long-term protection of human health and the environment, specifically protection from direct contact or gardening of plants which may uptake the soil contaminants and enter humans via ingestion, at a future date; the additional degree of protection which shall be achieved with the hazardous waste cap (as opposed to a solid waste cap, RCRA Subtitle D or Michigan Act 641) is cost effective; a hazardous waste cap shall decrease infiltration into the soils, thereby decreasing the mobility of cadmium, which was present at very elevated levels in the lagoon area soils and was detected above background levels in the soil column at 26 feet deep (groundwater table is at 29.5 feet deep).

Cadmium is one of the more mobile metals, and may pose a threat to groundwater in the future. See Figure 3.

Based on groundwater modelling, it is estimated that without treatment of the source area (the dry well area soils), groundwater may take over 100 years to clean itself up.

Years to Attain Groundwater Cleanup Standards: 100+ years
Capital Cost: $580,000
Annual Operation and Maintenance (O&M) Cost: $24,000
Present Net Worth (over 30 years): $940,000

Alternative 3A: Institutional controls; soil vapor extraction and excavation and landfilling of sludge layer in dry well area soils; cap over the lagoon area soils; pump and treat on-property groundwater, monitoring of off-property groundwater.

This Alternative includes the institutional controls described in Alternative 2; a Soil Vapor Extraction (SVE) system in the dry well area and excavation, solidification, and off-site landfilling of dry well area sludge; a hazardous waste cap which meets the requirements of Michigan Act 64 over the lagoon area soils; and pump and treat of on-property groundwater followed by discharge to a local POTW. See Figure 4.

A combination of SVE, excavation, solidification and off-site landfilling of the sludge layer identified in the dry well area soils shall be used to clean up the dry well area soils to the cleanup levels specified in Table 6, page 21 of this ROD.

The SVE process acts as a vacuum to strip contaminated vapors from the soil. These vapors shall then be treated before being allowed to be released to the atmosphere. All releases to the atmosphere shall meet the requirements of the Clean Air Act prior to discharge. The treatment residuals shall be tested by the Toxicity Characteristic Leaching Procedure (TCLP) to determine if the treatment residuals are a characteristic waste as defined in RCRA. Proper disposal of the treatment residual shall be determined upon completion of the TCLP. Vapor extraction wells shall be placed near the sources of contamination in the dry well area. The SVE wells shall provide a consistent supply of oxygen, remove waste products, and control soil moisture distribution.

After 2 to 5 years of operation, the dry well area soils shall be sampled and analyzed at a laboratory approved by U.S. EPA to determine how much contamination remains in the soils. Excavation, solidification and off-site landfilling of the sludge layer may be required by U.S. EPA. Prior to landfilling, the solidified soils shall be tested to determine if the waste is RCRA characteristic. If the waste is characteristic, Land Disposal Restrictions (LDR) shall apply to its disposal. If the contamination levels are at or below the cleanup levels set forth

in Table 6 of this ROD, no further action will be taken on these soils. If contamination in the soils remains above the cleanup standards, U.S. EPA shall evaluate further remedial activities.

Lagoon area soils shall be capped with a Michigan's Act 64 hazardous waste cap as described in Alternative 2.

This Alternative contemplates a pump and treat for groundwater located within the EV property. Groundwater shall be treated on the property by either granular or powdered activated carbon, air stripping, chemical oxidation/reduction, or photolysis/oxidation. After treatment, groundwater shall be discharged to a POTW. It is estimated that it will take 2 years to clean-up the on-property groundwater. Treatment residues from the groundwater treatment system shall be tested by the TCLP to determine if it is RCRA characteristic prior to disposal. RCRA Land Disposal Restrictions may be applicable to these wastes. The remaining off-property contaminated groundwater, from EV's northern property boundary to McCoy Creek, shall be monitored.

Years to Attain Groundwater Cleanup Standards: 53 years
Capital Cost: $3,000,000
O&M Cost: $330,000
Present Net Worth: $4,100,000

Alternative 3B: Institutional controls; soil vapor extraction and excavation and incineration of sludge layer in dry well area soils; cap on the lagoon area soils; pump and treat on-property groundwater, monitoring off-property groundwater.

This Alternative is identical to Alternative 3A, with the exception that the dry well area source material, the sludge layer, shall be excavated and incinerated off-site instead of landfilled. Incineration of the source material will eliminate long-term risk associated with the highly contaminated sludge by complete destruction of the contaminants.

Years to Attain Groundwater Cleanup Standards: 53 years
Capital Cost: $8,300,000
O&M Cost: $330,000
Present Net Worth: $9,400,000

Alternative 4A: Institutional controls; soil vapor extraction of dry well area soils followed by excavation and landfilling of remaining sludge layer; cap on the lagoon area soils; pump and treat all on- and off-property contaminated groundwater.

This Alternative is identical to Alternative 3A, with the addition of a comprehensive groundwater cleanup component. This Alternative provides for pumping and treating the entire contaminated groundwater plume which stretches from the EV property to McCoy Creek (see Figure 5). On-property groundwater shall be pumped and treated on-property and discharged to a POTW, and off-property groundwater shall be pumped and treated and discharged either to a POTW or to McCoy Creek. If off-property groundwater is discharged to the creek, it shall be required to meet the substantive requirements of an NPDES permit for discharge of treated groundwater to a surface water body. Treatment shall consist of either granular or powdered activated carbon, air stripping, chemical oxidation/reduction, or photolysis/oxidation. Any treatment residues from pumping and treating the groundwater shall be tested by the TCLP to determine if the residues are RCRA characteristic prior to disposal. It is estimated to take 35 years to clean up off-property groundwater.

U.S. EPA has determined, based on the groundwater modeling presented in the feasibility study report, that groundwater shall reach standards that are protective of human health and the environment in a shorter timeframe than may be achieved through natural attenuation. The time savings that can be achieved by pumping and treating the groundwater versus natural attenuation is estimated to be 30%-35%. The additional capital cost for an off-property pump and treat is estimated to be $400,000.

Years to Attain Groundwater Cleanup Standards: 35 years
Capital Cost: $3,400,000
O&M Cost: $440,000
Present Net Worth: $5,700,000

Alternative 4B: Institutional controls; soil vapor extraction of dry well area soils followed by excavation and incineration of remaining sludge layer; cap on the lagoon area soils; pump and treat all on- and off-property contaminated groundwater.

This Alternative is identical to Alternative 3B, with the addition of a comprehensive groundwater component. The comprehensive groundwater component consists of on-property and off-property pump and treat. Groundwater from near the dry well source shall be pumped and treated and discharged to a POTW, and off-property groundwater shall be pumped and treated and discharged either to a POTW or to McCoy Creek. If off-property groundwater is discharged to McCoy Creek, it shall be required to meet NPDES discharge permit requirements. Treatment shall consist of either granular or powdered activated carbon, air

stripping, chemical oxidation/reduction, or photolysis/oxidation. Any treatment residues from pumping and treating the groundwater shall be tested by the TCLP to determine if the residues are RCRA characteristic prior to disposal. If the wastes are characteristic, RCRA Land Disposal Restrictions shall be required to be met.

Years to Attain Groundwater Cleanup Standards: 35 years
Capital Cost: $9,000,000
O&M Cost: $440,000
Present Net Worth: $11,010,000

Alternative 5A: Institutional controls; excavate and landfill all contaminated sludge and soils in the dry well area; cap on the lagoon area soils; pump and treat all on- and off-property contaminated groundwater.

Alternative 5A is similar to Alternative 4A with the exception that all soils in the dry well area including the sludge shall be excavated, solidified on-property and landfilled off-property at a RCRA-permitted landfill. Dry well area soils shall be removed to a depth of 40 to 50 feet. The excavated area shall be filled with clean soil. Capping of the lagoon area shall be performed as in the other alternatives. Groundwater extraction and treatment shall be identical to the requirements set forth in Alternative 4A. See Figure 6.

Years to Attain Groundwater Cleanup Standards: 35 years
Capital Cost: $7,000,000
O&M Cost: $350,000
Present Net Worth: $8,900,000

Alternative 5B: Institutional controls; excavate and incinerate all contaminated sludge and soils in the dry well area; cap on the lagoon area soils; pump and treat all on- and off-property contaminated groundwater.

Alternative 5B is identical to Alternative 5A with the exception that the dry well area soils including the sludge shall be incinerated at an off-property facility rather than solidified and landfilled.

Years to Attain Groundwater Cleanup Standards: 35 years
Capital Cost: $11,000,000
O&M Cost: $350,000
Present Net Worth: $13,000,000

IX. COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the NCP, the relative performance of each alternative is evaluated using the nine criteria, 40 CFR Section 300.430(e)(9)(iii), as a basis for comparison. An alternative providing the "best balance" of trade-offs with respect to the nine criteria is determined from this evaluation.

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select a site remedy. Alternatives 4 and 5 contain a component for treatment of the off-property groundwater. Because a final remedy for groundwater will be addressed in the record of decision for the second operable unit, these alternatives will not be evaluated further in this first operable unit record of decision. The following is a summary of the comparison of each alternative's strength and weaknesses with respect to the nine evaluation criteria. The nine criteria are: 1) overall protection of human health and the environment; 2) compliance with applicable or relevant and appropriate requirements (ARARs); 3) long-term effectiveness and permanence; 4) reduction of toxicity, mobility or volume through treatment; 5) short-term effectiveness; 6) implementability; 7) cost; 8) state acceptance; and 9) community acceptance.

Overall Protection of Human Health and the Environment.

This criterion addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

All alternatives, with the exception of Alternative 1 (No Action), will reduce risks to human health. As the No Action alternative does not provide protection of human health and the environment, it is not eligible for selection and will not be discussed further. Alternative 2 reduces human exposure to contaminants through institutional controls. However, institutional controls may not guarantee reduced risks to human health in the future and institutional controls may not reduce the risk to the environment.

Alternatives 3A and 3B further minimize the risks to human health and the environment by treating the dry well area soils, which are the principal threat, and treating the on-property groundwater. Alternatives 3A and 3B rely on institutional controls to protect human health and the environment from risks posed by off-property groundwater. Institutional controls may not guarantee reduced risks to human health in the future. A final remedial decision for the off-property groundwater shall be made in the record of decision for the second operable unit for this site.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs).

Alternatives 3A and 3B shall meet all ARARs for this first operable unit action, which consists of treatment of the dry well area soils, closure of the lagoon area soils, and treatment of the groundwater which is located on the EV property. Alternative 2 may not meet ARARs pertaining to the groundwater in this first operable unit action in a reasonable time frame as Alternative 2 does not require active remediation of the groundwater.

Long Term Effectiveness and Permanence.

This criterion delineates the residual risk and evaluates the ability of an alternative to maintain reliable protection of human health and the environment over time, once cleanup objectives have been met.

Alternatives 2 and 3 offer protection of public health and the environment over the long term by treating or containing contaminants. However, treatment alternatives are more effective at eliminating risk in the long term than the containment alternatives.

Alternatives 3A and 3B are most effective at eliminating long term risk because groundwater shall be treated and monitored, the lagoon area soils shall be capped, and once the sludge layer has been effectively treated or is removed, residual risk in those soils shall be greatly decreased. Closure or other similar action shall be considered if the treatment system in the dry well area is unable to reduce contaminant levels to equal or below Michigan's Act 307 Type B cleanup levels.

U.S. EPA has decided to collect and evaluate additional data regarding the off-property groudnwater before a final remedy is selected for the off-property groundwater. A final remedy decision for the off-property groundwater shall be addressed in the record of decision for the second operable unit, after additional information is gathered (see discussion in "Documentation of Significant Changes" at the end of this ROD).

Reduction of Toxicity, Mobility, or Volume Through Treatment.

This criterion evaluates the anticipated performance of the treatment technologies a remedy may employ.

Alternatives 3A and 3B shall utilize treatment to reduce the toxicity, mobility or volume of contamination in the dry well area and in the on-property groundwater in order to protect human health and the environment. Treatment of the dry well area soils shall address the principal threat (sludge layer in the dry well area).

Alternative 2 does not utilize treatment for soils or groundwater.

Short-Term Effectiveness.

Short-term effectiveness addresses the period of time needed to achieve protection and evaluates any adverse impacts on human health and the environment that may be posed during the construction and implementation of the remedy.

All of the alternatives involve construction at the site. Protection of site workers and the community during the implementation of the selected alternative shall be addressed by site health and safety plans.

No unacceptable short-term risks or cross-media impacts shall be caused by the implementation of any of the alternatives. During the period required for remediation, institutional controls shall be used to mitigate the interim threats from possible use of contaminated groundwater and possible exposure to contaminated soils. The community and site workers may be exposed to contaminants in the soils and the air, and to dust and noise nuisance during implementation of the groundwater and soil remedies. Standard safety equipment, monitoring and dust control measures, shall mitigate any short-term risks.

Implementability.

This criterion considers the technical and administrative feasibility of implementing an alternative, including the availability of material and services needed to implement a particular option.

There will be some implementation problems for all of the alternatives. Deed restrictions which shall be required to be placed on all properties under which the contaminated groundwater flows could pose implementation problems because there are numerous parcels of properties under which the contaminated groundwater flows. Capping and SVE are well established technologies and should not be difficult to implement. Incineration, as contemplated by Alternative 3B, may pose problems with respect to locating an off-site incinerator to accept the waste.

Cost.

The estimated capital, annual operation and maintenance, and 30-year present worth costs for each of the alternatives is presented below:

Alternative	Capital Cost	O&M	Present Worth
1	$ 0	$ 0	$ 0
2	$ 580,000	$ 24,000	$ 940,000
3A	$ 3,000,000	$330,000	$ 4,100,000
3B	$ 8,300,000	$330,000	$ 9,400,000
4A	$ 3,400,000	$440,000	$ 5,700,000
4B	$ 9,000,000	$440,000	$11,010,000
5A	$ 7,000,000	$350,000	$ 8,900,000
5B	$11,000,000	$350,000	$13,000,000

State Acceptance.

The last two criteria, state and community acceptance are modifying criteria.

The Michigan Department of Natural Resources (MDNR) concurs with the U.S. EPA's selection of Alternative 3A as the preferred remedial alternative for the first operable unit for the EV site as presented in the next section.

Community Acceptance.

Based on the comments received by U.S. EPA, the community has expressed its desire for U.S. EPA to carefully consider and accept a proposal which EV presented to U.S. EPA during the public comment period for the final remedy selection. U.S. EPA has carefully considered EV's proposal and has decided to accept several of the components of EV's proposal. U.S. EPA has addressed why it has not accepted all components of EV's proposal and the community's concerns in the attached Responsiveness Summary. Briefly, the "common earth" cap which EV has proposed for the lagoon area soils does not afford long-term protection. The "common earth" cap is similar to a former Michigan Act 87 cap which was designed to last for only 2 years. Maintenance requirements for the "common earth" cap are expected to be excessive in light of the fact that the lagoon area soils cap shall need to be maintained indefinitely. In addition, the "common earth" cap proposed by EV does not keep infiltration from entering the contaminated lagoon area soils. Sampling conducted during the Remedial Investigation indicated that levels of cadmium and arsenic above background levels were detected at depths in the soil column of 26 feet and 23.5 feet, respectively. The groundwater table is located at 29.5 feet. These sampling results indicate that cadmium and arsenic are migrating toward

the groundwater table and may pose a threat to the groundwater. Cadmium is one of the more mobile metals. Therefore, a cap that does not reduce infiltration into the lagoon area soils is not sufficiently protective of the groundwater.

EV has proposed that five years of off-property groundwater monitoring be conducted instead of treatment of the off-property groundwater. However, U.S. EPA's groundwater guidance and the preamble to the NCP indicate that groundwaters which are currently being used as a drinking water source, or groundwaters which may be used as a drinking water source in the future (i.e., groundwaters which are not naturally unusable due to salinity or other natural factors), shall be actively remediated unless it is impracticable. At the EV site, MCLs have been exceeded and unacceptable risk has been identified with the groundwater. Also, the City of Buchanan's drinking water wells are located 4,000 feet west of the EV property. Therefore, in this first operable unit, the on-property groundwater shall be actively remediated. The second operable unit will address a final remedy decision for the off-property groundwater.

X. SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, as amended by SARA, and the NCP, the detailed analysis of the alternatives, and public comments, U.S. EPA has determined that Alternative 3A (institutional controls; soil vapor extraction of dry well area soils followed by excavation and landfilling of remaining sludge layer; Michigan's Act 64 cap on the lagoon area soils; pump and treat of the contaminated on-property groundwater and monitoring of the contaminated off-property groundwater) is the most appropriate remedy for the first operable unit to protect human health and the environment.

Alternative 3A shall achieve substantial risk reduction through soil vapor extraction followed by excavation of any of the remaining 2,100 cubic yards of sludge; capping of the lagoon area soils; and pumping and treatment of the contaminated on-property groundwater and monitoring of contaminated off-property groundwater. The dry well area soils, the source of the groundwater contamination, shall be treated for 2 to 5 years with SVE followed by excavation, solidification, and landfilling of any remaining sludge. If the dry well area soils do not meet cleanup standards after the SVE and excavation, additional treatment with SVE or closure shall be considered by U.S. EPA. The hazardous waste cap on the lagoon area soils shall ensure long-term effectiveness and permanence because it shall eliminate direct contact with the lagoon area soils both currently and in the future and shall eliminate or reduce infiltration which minimizes, if not eliminates contaminant movement in the soil column. The groundwater pump and treat for the contaminated on-property groundwater shall remediate the most highly contaminated

groundwater first. Monitoring of the off-property groundwater will allow U.S. EPA to detect any changes in the off-property groundwater before selecting a final remedy for the second operable unit. Alternative 3A provides the best balance of benefits, with respect to the nine evaluation criteria for this first operable unit among the alternatives considered.

A. Remediation Standards

The purpose of this response action is to control risks posed by ingestion and dermal contact with contaminated groundwater; ingestion, dermal and inhalation contact with lagoon area soils; and to treat the principal threat (dry well area soils). The future residential use scenario has been determined to pose an excess lifetime cancer risk of 4 X 10-4 and a hazard index of 18 from use of groundwater for drinking and showering. This risk relates to the concentration of vinyl chloride, 1,2-dichloroethene, benzene and trichloroethylene. Direct contact, ingestion and inhalation of vapors from lagoon area soils results in a hazard index of 2. This risk relates to the concentration of lead (up to 83 mg/kg) in these soils. These risks are outside U.S. EPA's acceptable risk range of 1X10-4 and 1X10-6 and exceeds the acceptable hazard index of 1. Michigan's Act 307 Rules sets forth cleanup levels for soils and groundwater. Michigan's Act 307 Type C cleanup levels will be achieved in the lagoon area soils, and Michigan's Act 307 Type B cleanup levels shall be achieved in the dry well area soils and in the groundwater located beneath the EV property. Off-property groundwater shall be monitored until a final remedy decision is made in the second operable unit ROD for this site.

XI. STATUTORY DETERMINATIONS

Under its legal authorities, U.S. EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

A. Protection of Human Health and the Environment

The selected remedy for the first operable unit for the EV site protects human health and the environment through treatment of the principal threat (dry well area soils), treatment of the contaminated on-property groundwater, capping of the lagoon area soils, and monitoring the off-property groundwater. The dry well area soils shall be treated with SVE to reduce contaminant levels to below Michigan Act 307 Type B levels. The sludge layer in the dry well area soils shall be excavated, solidified and landfilled if Type B cleanup levels cannot be met with SVE. If it is demonstrated that the SVE and excavation of the sludge layer cannot attain Michigan Act 307 Type B standards in the dry well area soils, continued treatment with SVE or closure shall be required by U.S. EPA. Lagoon area soils shall be contained with a Michigan Act 64 cap to ensure long term effectiveness and permanence from contact with these soils, and to eliminate infiltration. The contaminated on-property groundwater shall be pumped and treated. The contaminated off-property groundwater shall be monitored.

A limited investigation shall be conducted to determine if a lower aquifer exists at the site, and if so, if that lower aquifer is contaminated from EV site activities.

No unacceptable short-term risks or cross-media impacts shall be caused by the implementation of the remedy for the first operable unit. During the period required for remediation, institutional controls shall be used to mitigate the interim threats from possible use of contaminated groundwater and possible exposure to contaminated soils. The community and site workers may be exposed to organic and inorganic contaminants in the soils and air, and to dust and noise nuisance during implementation of the groundwater and soils remedies. Standard safety equipment, monitoring and dust control measures, shall mitigate any short-term risks.

B. Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy shall comply with the Federal and/or State, where more stringent, applicable or relevant and appropriate requirements (ARARs) listed below:

<u>Chemical Specific ARARs</u>

Chemical-specific ARARs regulate the release to the environment of specific substances having certain chemical characteristics. Chemical-specific ARARs typically determine the extent of clean-up at a site.

i. Groundwater

Federal ARARs

Maximum contaminant levels (MCLs) and, to a certain extent, non-zero maximum contaminant level goals (MCLGs), the Federal drinking-water standards promulgated under the Safe Drinking Water Act (SDWA), are applicable to municipal water supplies servicing 25 or more people. At EV, MCLs and MCLGs are not applicable, but are relevant and appropriate since the sandstone aquifer in the area of contamination is suitable for use as a source of drinking water in the future. The sandstone aquifer is currently being used as the drinking water source for the City of Buchanan. The city wells are located 4,000 feet west of the EV contaminant plume. MCLGs are relevant and appropriate when the standard is set at a level greater than zero (for non-carcinogens); otherwise, MCLs are relevant and appropriate. The point of compliance for Federal drinking-water standards is throughout the contaminated groundwater plume. For the purposes of this operable unit ROD, the point of compliance for groundwater for cleanup purposes shall be throughout the on-property plume within the EV property (see Figure 1). This first operable unit addresses only the contaminated groundwater located within the EV property boundary. The point of compliance for the off-property groundwater will be addressed in the second operable unit ROD.

State ARARs

The substantive provisions of Parts 6 and 7 of Michigan Act 307 rules and Rule 57 of Act 245 are relevant and appropriate to the EV site. U.S. EPA has determined that acceptable standards for groundwater clean-up, that have been derived under Type B criteria, are protective in all the areas of the plume. Clean-up levels derived under Type B criteria allow the aquifer to be restored to its beneficial uses by achieving risk-based clean-up standards. U.S. EPA has determined that these clean-up standards are protective of human health and the environment. The point of compliance for these standards is throughout the contaminated groundwater plume. For the purposes of this operable unit ROD, the point of compliance for groundwater for cleanup purposes shall be throughout the on-property plume within the EV property (see Figure 1). This first operable unit addresses only the contaminated groundwater located within the EV property boundary. The point of compliance for the off-property groundwater will be addressed in the second operable unit ROD.

U.S. EPA has determined that Type B criteria yields groundwater clean-up standards which also provide for the protection of surface water quality, in turn protecting human health and the environment.

Discussion

Alternative 3A will achieve the groundwater cleanup levels established pursuant to Act 307, Type B, for on-property groundwater. A final remedy decision for off-property groundwater will be made in the record of decision for the second operable unit.

For the purposes of this operable unit ROD, the point of compliance for groundwater for cleanup purposes shall be throughout the on-property plume within the EV property (see Figure 1). This first operable unit addresses only the contaminated groundwater located within the EV property boundary. The point of compliance for the off-property groundwater will be addressed in the second operable unit ROD; the final operable unit shall require compliance with Federal and State ARARS throughout the plume.

ii. Soils

State ARARs

MERA - Act 307, P.A. 1982 (Michigan Environmental Response Act) provides rules regarding the procedures for determining cleanup criteria for contaminants in groundwater, surface waters, soils, and air. Act 307 Type B criteria are relevant and appropriate for the dry well area soils, and Act 307 Type C criteria are applicable or relevant and appropriate for the lagoon area soils.

Discussion

The Michigan Act 307 Type B cleanup criteria shall be required to be met for groundwater and the dry well area soils. Type C cleanup criteria shall be required to be met for the lagoon area soils.

iii. Air

Federal ARARs

Regarding the Clean Air Act requirements, 40 CFR 50.1-50.12 requirements are applicable because emissions from the groundwater and soil treatment systems are subject to Primary and Secondary Ambient Air Quality Standards. Construction and treatment system activities are potential sources of fugitive dust, particulates, and VOCs and therefore, these activities are subject to the TSP standard.

State ARARs

Certain State Air Pollution Act requirements are ARARs. Act 348 contains rules regarding emission limitations and prohibitions

for particulate matter, fugitive dust, and VOCs. MAC Rule 336.1702, 336.1901, and 336.1373 requirements are applicable since emissions from the treatment system are subject to State standards for VOCs. Construction activities are potential sources of fugitive dust.

Discussion

The selected alternative shall meet air emission requirements through use of proper emission control devices.

Location-specific ARARs

Location-specific ARARs are those requirements that relate to the geographical position of a site. These include:

Federal ARARs

Executive Order 11988 and 40 CFR 264.18(b), Protection of Flood Plains, are relevant and appropriate for this site. This Order requires that the off-property groundwater treatment system be located above 100-year flood plain elevation and be protected from erosional damage. Any portion of the remedy that is constructed within the 100-year flood plain must be adequately protected against a 100-year flood event (i.e., geotextiles should be used to secure topsoil, etc.).

Section 404 of the CWA regulates the discharge of dredged or fill material to waters of the United States. Construction of surface water discharge points may be regulated under Section 404 of the CWA; therefore, the substantive requirements of Section 404 are relevant and appropriate to the remedial action at the site.

Action-specific ARARs

Action-specific ARARs are requirements that define acceptable treatment and disposal procedures for hazardous substances.

Federal ARARs

For landfill closure, RCRA Subtitle C requirements are relevant and appropriate because the lagoon area soils contain waste which is sufficiently similar to listed and/or characteristic RCRA Subtitle C waste. The Subtitle C cap is appropriate because long-term effectiveness and permanence of protection of human health and the environment shall be achieved with the cap.

RCRA Land Disposal Restrictions (LDR or Land Ban) are relevant and appropriate as applied to the solidified sludge layer if listed or characteristic RCRA Subtitle C hazardous wastes are identified in the sludge layer during sampling and analysis. The RI poorly defined inorganic contamination of the dry well area

sludge layer, and it is not known if listed or characteristic wastes are present in the sludge layer. Therefore, additional sampling of this area shall be required, and, if listed and/or characteristic RCRA Subtitle C hazardous wastes are identified, treatment requirements set forth in the Land Disposal Restrictions at 40 CFR Part 268 shall be satisfied prior to land disposal. In addition, LDRs are relevant and appropriate to any treatment residuals generated during remediation if the treatment residuals are determined to be listed or characteristic RCRA Subtitle C hazardous wastes.

Disposal of nonhazardous wastes are regulated under 40 CFR 257 and these requirements are applicable to disposal of nonhazardous wastes associated with this remedial action.

Disposal of the solidified sludge layer from the dry well area at an offsite landfill, if determined to be a hazardous waste, shall be regulated by 40 CFR 264.

40 CFR 264 and 40 CFR 268 (Subpart D) are applicable to excavation which shall occur in the dry well area to remove the sludge layer.

The only foreseeable manner in which the selected remedy may require storage or disposal of hazardous waste is when or if the groundwater treatment system requires emission control units to capture or contain volatile organics derived from aeration of the contaminated groundwater. The RCRA waste generation and temporary storage regulations under 40 CFR Part 262 are then applicable to that action. For example, spent activated carbon canisters utilized as emission controls shall be managed as characteristic waste if the waste canisters fail the Toxicity Characteristic Leaching Procedure (TCLP) test.

The treatment contemplated for some contaminated groundwater includes discharge of these liquids to a POTW. The POTW is regulated under 40 CFR 403.5, and the National Pollution Discharge Elimination System (NPDES). The actions of this remedy shall meet the substantive requirements of NPDES.

Direct discharge of treatment system effluent is regulated by 50 FR 30784 (July 29, 1985), 40 CFR 122.44, 40 CFR 122(a), 40 CFR 122.21, 40 CFR 125.100, 40 CFR 125.104, and 40 CFR 136.1-136-4. These requirements are all applicable to discharge of treated groundwater to McCoy Creek.

Applicable post-closure care requirements to ensure that the site is maintained and monitored are set forth in 40 CFR 264.310.

Responsibilities for offsite transportation of hazardous wastes shall be applicable to the transportation of the solidified dry well area sludge layer. See 40 CFR 262, 263 and 49 CFR 100-199.

State ARARs

The State of Michigan has been authorized to administer the hazardous waste program within the State. Under Hazardous Waste Management Act 64 of 1979, as amended, the State regulates the generation, transport, treatment, storage, and disposal of hazardous waste. Act 64 also regulates the closure, and the postclosure care, of hazardous waste disposal facilities in the State. As with RCRA Subtitle C, above, Act 64 is relevant and appropriate to closure of the lagoon area soils. Act 64 is applicable to the treatment residuals from on-site treatment.

Parts 4, 9, and 21 of the Water Resources Commission Act 245 of 1929, as amended, establishes rules for water quality by prohibiting injurious discharges to surface water. These rules are applicable to the discharge of treated groundwater to McCoy Creek or to a POTW treatment system.

The Michigan Environmental Response Act 307 of 1982, as amended (Act 307), provides for the identification, risk assessment, and evaluation of contaminated sites within the State. The U.S. EPA has determined that the substantive provisions of Parts 6 and 7 of Act 307 are relevant and appropriate to the EV site. The Act 307 rules require that remedial actions shall be protective of human health, safety, the environment, and the natural resources of the State. To achieve this standard of protectiveness, the Act 307 rules require that a remedial action achieve a degree of clean-up under either Type A (clean-up to background levels), Type B (clean-up to risk-based levels), or Type C (clean-up to risk-based levels under site-specific considerations) criteria. Type B criteria shall generally apply at sites where the desired outcome is to allow the site to be returned to unrestricted use at the completion of the remedial action. Type C cleanups shall generally apply at the largest and most complex sites, and at sites where the uses of the property are expected to be limited at the completion of the remedial action. U.S. EPA has determined that the Type C criteria are appropriate for the lagoon area soils since this area of the site is located in a natural depression area and therefore use of the area would be limited (e.g., homes would probably not be built in a natural depression area). However, protection is still required since homes could be built on the EV property where the building currently exists and the lagoon area soils would become the backyard to these future homes. Type B criteria are appropriate for the groundwater and the dry well area soil portions of this remedy because the goal of the selected remedy is to return the groundwaters and dry well area soils to unrestricted use.

C. Cost-Effectiveness

The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its

costs, the net present worth value being $4,100,000. The only alternatives that are less costly than the selected alternative are Alternatives 1 and 2.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

U.S. EPA has determined that Alternative 3A represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the first operable unit for the EV site. U.S. EPA has determined that Alternative 3A provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, and cost, also considering the statutory preference for treatment as a principal element and considering State and community acceptance for the first operable unit.

Alternative 3A shall significantly reduce the inherent hazards posed by the contaminated soils by treatment of dry well area soils with soil vapor extraction and excavation of the source (sludge layer), if necessary.

Alternative 3A treats the principal threat, the dry well area soils which are the source of groundwater contamination. Alternative 3A affords greater long term effectiveness and permanence and affords greater reduction of toxicity, mobility, or volume through treatment than Alternative 2 because on-property groundwater shall be treated. Short-term effectiveness is similar for all the alternatives considered, approximately 1 year. All of the alternatives will have similar implementability problems. Alternative 3A is the least costly option which provides for on-property groundwater treatment.

Alternative 3A provides a significantly greater degree of long-term effectiveness and permanence, reduction of toxicity, mobility and volume than Alternative 2, and is cost-effective.

E. Preference for Treatment as a Principal Element

By treating the dry well area soils, which are the source of the groundwater contamination, and then excavating, solidifying and landfilling the remaining sludge layer, the selected remedy addresses the principal threat posed by the site through the use of treatment technologies. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied for this operable unit.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

A significant change has been made in the remedy selected for the EV site since the publication of the FS and the Proposed Plan in September 1991. The remedy recommended in the Proposed Plan was Alternative 4A: institutional controls; soil vapor extraction of dry well area soils followed by excavation and landfilling of remaining sludge layer; Michigan's Act 64 cap on the lagoon area soils; pump and treat all on- and off-property contaminated groundwater. Since publishing the Proposed Plan, U.S. EPA has determined that an operable unit approach is more appropriate for this site than selection of a final remedy at this time. The Agency's decision to utilize an operable unit approach was made after considering the substantial number of public comments which preferred monitoring the off-property groundwater rather than actively remediating the off-property groundwater through pump and treat. U.S. EPA has determined that the operable unit approach is more appropriate at this time because it allows a more focused, logical approach, whereby the contaminated soils, which are the source of groundwater contamination, and the more highly contaminated groundwater, the on-property groundwater, are treated first. The treatability study is required under this first operable unit ROD. U.S. EPA will evaluate the effect of a treatability study on soils and on-property groundwater prior to making a final remedy decision for the off-property groundwater in the second operable unit ROD.

U.S. EPA has determined that the first operable unit, which is addressed by this ROD, shall consist of institutional controls; soil vapor extraction and excavation and landfilling of the sludge layer in dry well area soils; Michigan's Act 64 cap over the lagoon area soils; pump and treat on-property groundwater, and monitoring of off-property groundwater. A treatability study shall be conducted on the dry well area soils and the on-property groundwater beginning the summer of 1992 for a period of one year. The treatability study will be conducted with the cooperation of U.S. EPA's Superfund Innovative Technologies Evaluation (SITE) Program in Cincinnati, Ohio. The treatability study shall test the effectiveness of an innovative technology called the Subsurface Volatilization and Vapor System (SVVS), which is a combination air sparging/bioremediation system, and should be effective at cleaning up both the dry well area soils and the on-property groundwater at the EV site. The determination that this innovative technology may be effective at this site was made in November 1991. The advantages to the SVVS system are that most of the treatment is completed in-situ and the system is expected to clean up the soils and groundwater faster and be less expensive than conventional treatment systems. For further information regarding this technology, consult the Administrative Record for this site. If the treatability study indicates the SVVS system is effective at cleaning up the contaminants at the EV site, U.S. EPA will consider using this

technology to clean up the off-property groundwater in the second operable unit ROD in accordance with CERCLA and the NCP.

The Record of Decision (ROD) has also reordered the manner in which the chosen technologies will be applied to the dry well area soils, in accordance with EV's suggestion. The Proposed Plan indicated that excavation, solidification and landfilling of the sludge layer in the dry well area soils would be completed first, followed by soil vapor extraction (SVE) to remove residual contamination. The ROD indicates that SVE will be completed on the dry well area soils for 2 to 5 years followed by excavation, solidification and landfilling of any remaining sludge.

The remedy selected for this first operable unit is Alternative 3A: institutional controls; soil vapor extraction and excavation and landfilling of sludge layer in dry well area soils; Michigan's Act 64 cap over the lagoon area soils; pump and treat on-property groundwater; and monitoring of off-property groundwater. This change in remedy selection is a logical outgrowth based on the information available during the public comment period and the comments submitted. Alternative 3A has been determined to provide the most appropriate balance of tradeoffs among the alternatives, with respect to pertinant criteria, given the limited scope of this action.

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RESPONSIVENESS SUMMARY

This Responsiveness Summary has been prepared to meet the requirements of Sections 113(k)(2)(B)(iv) and 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires the U.S. EPA to respond "...to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for remedial action. The Responsiveness Summary addresses concerns expressed by the public, potentially responsible parties (PRPs), and governmental bodies in the written and oral comments received by the U.S. EPA and the State of Michigan regarding the proposed remedy for the Electro-Voice, Inc. (EV) site.

A. Overview

The remedy selected for the first operable unit for the EV site includes:

> Deed restrictions on the EV property and all properties under which the contaminated groundwater moves; soil vapor extraction (SVE) and excavation, solidification and off-site landfilling of the sludge layer in the dry well area soils; hazardous waste cap the lagoon area soils; pump and treat all on-property contaminated groundwater; monitoring off-property groundwater.

The second operable unit will address a final remedial action for off-property groundwater.

The selected alternative was identified as Alternative 3A in the Feasibility Study Report dated July 11, 1991, and in the Proposed Plan dated September 1991. More detailed information on the selected alternative, as well as other alternatives considered to remediate this site, is available in these documents. The documents are available in the information repository and administrative record for the site at the Buchanan Public Library.

A significant change has been made in the remedy selected for the EV site since the publication of the FS and the Proposed Plan in September 1991. The remedy recommended in the Proposed Plan was Alternative 4A: institutional controls; soil vapor extraction of dry well area soils followed by excavation and landfilling of remaining sludge layer; Michigan's Act 64 cap on the lagoon area soils; pump and treat all on- and off-property contaminated groundwater. Since publishing the Proposed Plan, U.S. EPA has determined that an operable unit approach is more appropriate for this site than selection of a final remedy at this time. The Agency's decision to utilize an operable unit approach was made

after considering the substantial number of public comments which preferred monitoring the off-property groundwater rather than actively remediating the off-property groundwater through pump and treat.

U.S. EPA has determined that the first operable unit, which is addressed by this ROD, shall consist of institutional controls; soil vapor extraction and excavation and landfilling of the sludge layer in dry well area soils; Michigan's Act 64 cap over the lagoon area soils; pump and treat on-property groundwater, and monitoring of off-property groundwater. The Agency shall be conducting a treatability study on the dry well area soils and the on-property groundwater beginning this summer for a period of one year. The treatability study will be conducted with the cooperation of U.S. EPA's Superfund Innovative Technologies Evaluation (SITE) Program in Cincinnati, Ohio. The treatability study shall test the effectiveness of an innovative technology called the Subsurface Volatilization and Vapor System (SVVS), which is a combination air sparging/bioremediation system, and should be effective at cleaning up both the dry well area soils and the on-property groundwater at the EV site. The determination that this innovative technology may be effective at this site was made in November 1991. The advantages to the SVVS system are that most of the treatment is completed in-situ and the system is expected to clean up the soils and groundwater faster and be less expensive than conventional treatment systems. For further information regarding this technology, consult the Administrative Record for this site. If the treatability study indicates the SVVS system is effective at cleaning up the contaminants at the EV site, U.S. EPA will consider using this technology to clean up the off-property groundwater in the second operable unit ROD in accordance with CERCLA and the NCP.

The Record of Decision (ROD) has also reordered the manner in which the chosen technologies will be applied to the dry well area soils, in accordance with EV's suggestion. The Proposed Plan indicated that excavation, solidification and landfilling of the sludge layer in the dry well area soils would be completed first, followed by soil vapor extraction (SVE) to remove residual contamination. The ROD indicates that SVE will be completed on the dry well area soils for 2 to 5 years followed by excavation, solidification and landfilling of any remaining sludge.

B. Background on Community Involvement

The Remedial Investigation (RI) report, Feasibility Study (FS) report and the Proposed Plan for the EV site were released to the public for comment on October 1, 1991. These documents were made available to the public in both the administrative record file and an information repository maintained at the U.S. EPA offices in Region V and at the Buchanan Public Library. The notice of availability for these documents was published in the Niles Daily

Star on September 26, 1991, and the South Bend Tribune on September 27, 1991. A public comment period on the documents was originally planned for October 1, 1991, through November 29, 1991. The comment period was extended upon the request of the Buchanan City Manager to December 13, 1991. Notice of the extension of the public comment period was published in the Berrien County Record on November 27, 1991, and the Niles Daily Star and the South Bend Tribune on November 29, 1991. In addition, two public meetings were held by U.S. EPA in Buchanan on October 30, 1991 and November 14, 1991. Notice of the first public meeting was published in the Niles Daily Star on September 26, 1991, and the South Bend Tribune on September 27, 1991. Notice of the second public meeting was published in the Niles Daily Star, the South Bend Tribune, and the Berrien County Record on November 6, 1991. At the public meetings, representatives from U.S. EPA and the Michigan Department of Natural Resources (MDNR) answered questions about problems at the site and the remedial alternatives under consideration. Comments received during this period are included in this Responsiveness Summary.

C. Summary of Comments Received and Agency Responses

The public comments regarding the EV site are organized into two categories:

- Summary of comments from the community; and
- Summary of comments from EV.

Many of the comments below have been paraphrased in order to effectively summarize them in this document. The Administrative Record contains copies of written comments submitted during the public comment period and a written transcript of the public meetings held on October 30 and November 14, 1991, which includes the oral comments received during the formal comment session of that meeting. No comments were received from the State of Michigan on the Proposed Plan during the public comment period.

Comments from the Community

Comments received from the community and responses are listed below:

1. Comment. Many commenters who urged U.S. EPA to select EV's proposal for a final remedy at the EV site expressed their concern that selection of U.S. EPA's preferred alternative would have a severe economic impact on EV and the City of Buchanan.

Response. U.S. EPA was particularly concerned with the community's fear that choosing U.S. EPA's preferred alternative would place an undue economic burden on EV and therefore the community. EV has never made any representation to U.S. EPA that the preferred alternative would cause EV to eliminate jobs or leave the City of Buchanan. In fact, EV has provided U.S. EPA with confidential financial information demonstrating that EV is a financially sound company that can afford to implement any of the alternatives identified in the Proposed Plan. Any decision made by EV to eliminate jobs or leave the City of Buchanan will likely be based on other considerations than the financial condition of EV. U.S. EPA is required to choose a remedy that provides the best balance among the nine criteria discussed more fully in the ROD, and the financial situation of a company is not considered in this analysis. If a responsible party cannot afford to finance the selected response, the Superfund must pay for the remediation. In this case, the responsible party, EV, has demonstrated that it can pay for the remediation of this site.

2. Comment. A petition was presented at the November 14, 1991, public meeting urging U.S. EPA to adopt EV's proposal for final remedy selection at the EV site. The petition states that institutional controls and source control are an effective solution to the EV problem.

Response. U.S. EPA entered into a formal negotiation period with EV from October 1, 1991, to January 29, 1992, regarding the implementation of a final remedy for the site as required by U.S. EPA's Administrative Order by Consent with EV dated October 15, 1987. U.S. EPA received EV's proposal for a final remedy for the EV site on November 21, 1991, and a second proposal on December 13, 1991. The EV proposals consisted of:

- Treatment of the dry well area soils with Soil Vapor Extraction (SVE) and in-situ bioremediation followed by excavation, solidification and landfilling of any remaining sludge;

- Capping of the lagoon area soils with a "common earth" cap;

- Pump and treat of contaminated groundwater which is located under the EV property;

- Five years of monitoring of contaminated groundwater which is located beneath properties not owned by EV.

U.S. EPA met with EV on October 15, 1991, November 21, 1991, January 16, 1992, and January 27, 1992 to discuss the final remedy for the EV site. In addition, U.S. EPA participated in conference calls with EV on October 29, 1991, December 12, 1991, and December 20, 1991, regarding the final remedy for the site.

After carefully considering EV's proposals, and after many discussions with representatives of EV, U.S. EPA decided that an operable unit approach would be more appropriate than one final remedy decision for this site. By deferring the final remedy decision for the off-property groundwater, U.S. EPA will be able to collect and evaluate additional data before making a final decision on the off-property groundwater. U.S. EPA will be conducting a treatability study on the dry well area soils and the on-property groundwater using an innovative technology called the Subsurface Volatilization and Ventilation System (SVVS). If this technology is effective on the contamination at the EV site, U.S. EPA will consider use of this technology for remediation of the off-property groundwater.

The remedy selected for the first operable unit includes some components of EV's proposal, namely the SVE followed by excavation, solidification, and off-site landfilling of sludge for the dry well area soils, pump and treat of the on-property groundwater, and monitoring of the off-property groundwater until a final remedy decision is made in the second operable unit. However, U.S. EPA has determined that the "common earth" cap which EV has proposed for the lagoon area soils will not afford long-term protection due to the fact that the "common earth" cap is similar to a former Michigan Act 87 cap which is designed to only last 2 years. Maintenance requirements for the "common earth" cap would be excessive. In addition, the "common earth" cap proposed by EV would not keep infiltration from entering the contaminated lagoon area soils. Sampling conducted during the Remedial Investigation indicated that levels of cadmium and arsenic above background levels were detected at depths in the soil column of 26 feet and 23.5 feet, respectively. The groundwater table is located at 29.5 feet. These sampling results indicate that cadmium and arsenic are migrating toward the groundwater table and may pose a threat to the groundwater in the future. Cadmium is one of the more mobile metals. Therefore a cap which will not reduce infiltration into the lagoon area soils is not sufficiently protective of the groundwater.

EV has proposed that five years of off-property groundwater monitoring be conducted instead of pump and treat. U.S. EPA's groundwater guidance and the preamble to the NCP indicate that if groundwaters which are currently being used

as a drinking water source, or groundwaters which could be used as a drinking water source in the future (i.e., groundwaters which are not naturally unusable due to salinity or other natural factors), will be actively remediated unless it is impracticable. At the EV site, MCLs have been exceeded and unacceptable risk has been identified with the groundwater. However, U.S. EPA has decided to use an operable unit approach in order to allow the Agency to conduct a treatability study on the on-property groundwater using an innovative technology which is expected to remediate EV site contamination faster and cheaper than conventional groundwater pump and treat.

3. Comment. Many commenters expressed concern over the cost of U.S. EPA's preferred alternative which was identified in the Proposed Plan as opposed to the cost of EV's proposed final remedy.

Response. U.S. EPA has determined that an operable unit approach is appropriate for this site and have subsequently chosen Alternative 3A, rather than Alternative 4A, as the selected remedy for the first operable unit. The second operable unit will address a final remedy for off-property groundwater.

However, many of the commenters urged U.S. EPA to perform a cost/benefit analysis of U.S. EPA's and EV's proposals for the final remedy. In selecting a final remedy, U.S. EPA does not perform a cost/benefit analysis; instead, U.S. EPA is required to select a "cost-effective" remedy. A "cost/benefit" analysis is a quantitative evaluation of costs versus benefits associated, here, with selecting the final remedy. Cost/benefit analyses are very difficult to conduct when the benefits cannot be reduced to a dollar value. For example, there can be no dollar value assigned to human life, to human health, or to environmental damage resulting from contamination. Cost-effectiveness is a qualitative evaluation of protection to human health and the environment versus costs.

Regarding costs associated with the lagoon area soils, capping of the lagoon area soils with a hazardous waste cap will provide long-term protection against dermal contact and ingestion and also will reduce infiltration, thus protecting the groundwater from future further contamination. A "common earth" cap proposed by EV will require extensive maintenance and will not reduce infiltration. The difference in cost between the two caps is approximately $150,000, not taking into account the cost of maintaining the "common earth" cap. U.S. EPA has weighed all of these factors in selecting the remedy for this first operable unit ROD.

4. Comment. One commenter requested that U.S. EPA make the question and answer portions of the two public meetings held by U.S. EPA in Buchanan part of the public comment and the administrative record.

Response. U.S. EPA has placed the transcripts from both public meetings in the administrative record for this site. The significant comments raised during the public meetings are addressed in this Responsiveness Summary.

5. Comment. Several comments indicated their belief that EV was mistakenly placed on the National Priorities List (NPL).

Response. EV has previously inquired about the purported mistaken listing of the EV site. U.S. EPA's response to EV is included in the administrative record in a letter to U.S. Representative Fred Upton, dated June 25, 1991. To summarize that letter, EV was not mistakenly placed on the NPL, and the results of the RI and risk assessment clearly demonstrate that the site poses a risk to human health.

6. Comment. Several commenters stated that there appears to be no real threat to anyone and that if EV were to be allowed to implement its proposed plan the people of Buchanan would be safe both now and in the future.

Response. As stated in Comment 5, the RI and the risk assessment clearly demonstrate that the EV site poses a risk to human health. See the Summary of Site Risks, page 11 of the ROD for detailed information on how U.S. EPA calculates risk.

7. Comment. One commenter stated that she felt U.S. EPA answered a number of the questions at the October 30, 1991, public meeting by indicating the question was a design issue and would be addressed during the design of the remedial action.

Response. Many of the questions posed by members of the public during the two public meetings were specific questions such as where extraction and treatment wells would be placed and whether an air stripper would be required. The placement of extraction and treatment wells and the potential use of an air stripper are matters that will not be decided until EV or U.S. EPA begins designing the remedial action, and this will occur after it is decided whether EV or U.S. EPA will implement the final remedy. The final remedy describes the general manner in which the site will be remediated, and does not prescribe the finer details that need to be considered for implementation.

8. Comment. Some commenters indicated they thought the future use scenario assumptions for the EV property are unlikely.

Response. In developing an understanding of the risk associated with the EV property soils, U.S. EPA has determined that a future residential use scenario of the EV property is appropriate based on the fact that the EV property is bounded on the east by an elementary school and on the north, south and west by homes. Accordingly, it is appropriate for U.S. EPA to evaluate the risks associated with the EV property soils in a situation where the EV property is sold and then developed for residential use, as residential use is a likely future use of the EV property.

Based on U.S. EPA's experience on other Superfund sites, the potential for private landowners to install drinking water wells into contaminated groundwater, even when the community is aware of the danger, is not as remote as common sense would lead us to believe.

9. Comment. One commenter stated that the levels of contamination in the off-property groundwater, if coming from an effluent pipe would be allowed to be discharged directly to McCoy Creek with no treatment prior to discharge.

Response. The issue at the EV site is not whether effluent with levels of contamination similar to the levels of contamination of the aquifer at the EV site could be discharged into McCoy Creek with no treatment. U.S. EPA has determined that the discharge from the contaminated aquifer does not have an adverse impact on McCoy Creek. U.S. EPA is instead concerned about private well users' exposure to contaminated groundwater, and is therefore concerned about the levels of hazardous substances in the groundwater.

10. Comment. One commenter was concerned about the U.S. EPA's proposal to locate purge wells and an air stripper in the vicinity of the old Kingery Mill Pond because the City of Buchanan is planning to rehabilitate this area and the wells and air stripping tower would destroy the aesthetic beauty of this area.

Response. The placement of purge wells and the use of an air stripper are issues relating to how the extraction and treatment system is designed. The placement of purge wells will be based on where the designer of the extraction and treatment system believes that the purge wells will be most effective. The use of an air stripper is an option that may be chosen by the designer of the extraction and treatment system; however, there are other treatment options, such as carbon adsorption which could be just as effective in

treating the groundwater, but may be less intrusive to the Kingery Mill Pond area.

U.S. EPA is very aware of the plans that are in progress to revitalize the City of Buchanan's downtown area. In fact, U.S. EPA has received a copy of the proposals under way for the downtown area from the Downtown Development Authority. If active remediation of the off-property groundwater is determined under the second operable unit to be required, U.S. EPA will do its best to work with the City of Buchanan and the Downtown Development Authority in designing the extraction and treatment system that may be placed in part on City-owned property.

11. Comment. One commenter wanted to know why U.S. EPA disapproved EV's FS report.

Response. U.S. EPA's disapproval of EV's FS report occurred after EV exercised its right to formally dispute U.S. EPA's disapproval of EV's FS report. U.S. EPA disapproved a draft Feasibility Study (FS) report which was prepared by EV on November 15, 1990, for reasons including the following: failure to include any remediation goals, a fundamental component of the FS which is required by the NCP; uncertainty with the accuracy of alternative costs and time to reach cleanup goals; a lack of detail regarding specific components of some of the alternatives (e.g., bioremediation of dry well area soils and groundwater, in-situ vitrification of dry well area soils, discharge of treated groundwater to a publicly owned treatment works); failure to analyze applicable or relevant and appropriate requirements (ARARs) which were identified to EV, specifically Michigan's Act 307 Rules; and concern by the Agency regarding EV's interpretation of the NCP, which is inconsistent with U.S. EPA's interpretation of the NCP. U.S. EPA advised EV in a meeting and a letter dated November 15, 1990, that if all U.S. EPA's comments were not incorporated into the final FS report, the Agency would consider exercising its options under the Administrative Order by Consent (AOC) which EV entered into with U.S. EPA on October 15, 1987.

The final FS report which EV prepared was not satisfactory and was subsequently disapproved on February 28, 1991. At that time, U.S. EPA informed EV that the Agency would exercise its options under the AOC and complete the FS report.

The final FS report which EV prepared was not satisfactory because it failed to adequately incorporate ARARs; failed to adequately address risks associated with future use of groundwater; failed to screen response-unit-specific alternatives in accordance with the NCP and U.S. EPA

guidance; failed to bring a comprehensive groundwater cleanup alternative to the detailed analysis; and failed to conduct the nine criteria analysis in accordance with the NCP and Agency guidance.

12. Comment. One commenter expressed concern because U.S. EPA was basing its decision on whether or not to clean up the groundwater on modelling.

Response. The decision to clean up groundwater is not based on modelling; the decision is based on the risks to human health and the environment associated with the groundwater and the soils at the EV site. A model of the groundwater is one of the techniques used to understand the movement of a plume of contamination within the groundwater aquifer. A model is a tool to aid in trying to understand what is happening within an aquifer.

13. Comment. A number of commenters referred to EV's offer to clean up the dry well area soils sometime after the site was placed on the NPL, and indicated that EV was not allowed to conduct this cleanup.

Response. U.S. EPA has no information regarding EV offering to clean-up the dry well area soils after being placed on the NPL. U.S. EPA contacted EV regarding this matter. EV indicated that they had never offered to clean up the dry well area soils, and indicated that EV did not even know there was a problem with those soils until the Remedial Investigation was conducted.

14. Comment. One commenter wanted to know why U.S. EPA decided to rent a sound system for the public meeting U.S. EPA held on November 14, 1991, in Buchanan. Many of the attendees at the November 14, 1991, meeting informally expressed this same concern to representatives of EPA and MDNR.

Response. During the public meeting held on November 14, 1991, EV offered to provide U.S. EPA and MDNR with a public sound system for the evening. U.S. EPA thanked EV for the courtesy, but respectfully declined to use the EV system because U.S. EPA's use of the system might create an appearance of impropriety. For example, it might appear that EV was attempting to influence the U.S. EPA employees by offering the use of an EV sound system for U.S. EPA's meeting. Of course, EV did not intend to attempt to influence U.S. EPA by offering U.S. EPA the use of its sound system; however, the rules governing what employees of U.S. EPA may accept from potentially responsible parties are very strict, and are strictly enforced. For your information, other rules to prevent the appearance of impropriety by U.S. EPA employees include such items as not accepting meals or

gifts from potentially responsible parties.

15. Comment. One commenter stated that the Buchanan City Manager had indicated at U.S. EPA's October 30, 1991, public meeting that studies demonstrated that the geology of the plume area was not adequate for the development of municipal wells.

Response. With respect to the geology in the area of the plume of contamination, U.S. EPA is concerned with both public and private use of the groundwater. Although the City of Buchanan might decide at this time not to use the contaminated aquifer for a municipal water supply, even with a private well ban in place, private property owners might decide to drop a private well into the contaminated aquifer. Although during the public meeting members of the public stated strongly that nobody in Buchanan would drop a private well into the contaminated aquifer, again, there is no guarantee that such an activity would not occur.

16. Comment. One commenter stated his belief that the City of Buchanan can effectively enforce local institutional controls against drilling of groundwater wells in the area of the EV plume.

Response. U.S. EPA will be relying on a combination of institutional controls and active remediation of the soils and on-property groundwater during the implementation of this operable unit. The issue of institutional controls will be further addressed in the second operable unit ROD for this site.

17. Comment. One commenter stated that based on an extensive hydrogeological study conducted by the City of Buchanan as part of the local groundwater supply study, the area where the EV plume is located would be a "ridiculous location" for a water well because the plume area is located near a number of potential groundwater contamination sources.

Response. The map which this commenter enclosed: Locations of Potential Sources of Groundwater Contamination, Figure 4, City of Buchanan Water Supply Study, September 1989, shows numerous sources of potential groundwater contamination throughout the City of Buchanan and the surrounding area. The current location of the City's water supply wells, 4,000 feet west of the EV property, does not appear to be any less free from potential sources of groundwater contamination than the area where the EV plume is located. In fact, from the enclosed map, it appears there are no locations in the City of Buchanan which are completely free from some potential source of groundwater contamination. Therefore, it does not appear that the area where the EV plume is

located is any more of a "ridiculous" location for a water well then any other location in the Buchanan area.

18. Comment. One commenter wanted to know what U.S. EPA's real intent is at the EV site.

Response. U.S. EPA's real intent at the EV site is to select and implement a remedy that protects public health and the environment.

19. Comment. One commenter was concerned that if U.S. EPA accepted EV's proposal for final cleanup of the site, U.S. EPA would be accepting a proposal which does not meet State and Federal law and sets a precedent in Michigan for irresponsibility on the part of potentially responsible parties ("PRPs") for cleaning up the natural resources that it has contaminated. This commenter was also concerned that if U.S. EPA accepted EV's proposal, this decision would call into question all currently U.S. EPA-approved cleanup plans.

Response. Clearly, U.S. EPA does not want to select a remedy at the EV site that has the appearance of rewarding a PRP for its irresponsibility in contaminating a natural resource. U.S. EPA has selected a remedy that is based on the circumstances at this site, and is consistent with other remedies at U.S. EPA's Superfund sites.

20. Comment. One commenter was concerned that the City of Buchanan and The Downtown Development Authority were not involved in developing the remediation plan for the EV site.

Response. Please see the Response to Comment 10.

21. Comment. One commenter indicated that U.S. EPA was unwilling to discuss the EV proposal for a final remedy.

Response. U.S. EPA did not receive EV's proposal for a final remedy of the EV site until November 21, 1991, which was after the second public meeting conducted by U.S. EPA for the EV site. This proposal was substantially modified on December 13, 1991. Therefore, U.S. EPA was not prepared to comment on the EV proposal during the public meetings on October 30, 1991, and November 14, 1991.

In addition, the purpose of a public comment period is to allow all members of the public the opportunity to comment on the alternatives described in the Proposed Plan issued by U.S. EPA. The purpose of a public comment period is not to allow the public to provide comments on U.S. EPA's comments regarding a proposal put forth by any member of the public. The public can certainly support a proposal put forward by any other member of the public, and can urge U.S. EPA to

consider the merits of that proposal; however, it is impossible for U.S. EPA to advise the public about what remedy U.S. EPA will choose in the Record of Decision ("ROD") for any site until the ROD has been signed by the Regional Administrator. Until the ROD is signed by the Regional Administrator, U.S. EPA does not make a decision on the final remedy that will be selected in the ROD.

22. Comment. One commenter asked if there would be a review by a third party of the differing calculations for the groundwater modelling.

Response. Technical experts often differ in their approaches to groundwater modelling. As stated above, modelling is a tool to aid in the understanding of how a plume of contamination is travelling through an aquifer, and is not meant to be a definitive representation of that plume. U.S. EPA will not be hiring a third party to review the groundwater modelling.

23. Comment. One commenter suggested that alternate concentration limits (ACLs) were appropriate for the EV contaminant plume because the commenter believes this groundwater is unsuitable for human consumption.

Response. The criteria for an ACL is set forth in Section 121(d)(2)(B)(ii) of CERCLA, as amended, and requires that all property under which the plume of contamination travels is owned or controlled by the site owner seeking an ACL. EV does not own or control the property under which the plume of contamination travels; there is approximately one-half mile of private residences and City-owned property that EV does not own or control. Therefore, the use of an ACL is not appropriate for the EV site.

24. Comment. One commenter indicated that other U.S. EPA Region V Record of Decisions chose natural attenuation for groundwater, specifically, Wheeler Pit in Wisconsin, Burlington Northern in Minnesota, Cliffs-Dow Disposal in Michigan and Charlevoix in Michigan.

Response. On January 24, 1992, U.S. EPA met with EV's contractor to discuss these Records of Decisions (RODs). The contractor agreed that since the Burlington Northern ROD was pre-SARA (pre-1986), it was not relevant to the EV site. The contractor, however, felt that the Charlevoix ROD, which is also a pre-SARA ROD, was relevant to the EV site. Charlevoix, however, can be distinguished from EV for the following reasons: (1) Charlevoix is a pre-SARA ROD, and SARA established U.S. EPA's current groundwater policy, which is to restore usable groundwaters to their beneficial uses whenever practicable; (2) no source of groundwater

contamination was located at the Charlevoix site; at EV the source of groundwater contamination has been identified; (3) the aquifer thickness at Charlevoix was approximately 100 feet thick, which means the volume of water that required treatment was significant relative to the volume of water that requires treatment at EV where the aquifer is 50 feet at the EV property, but narrows down to 10 feet by McCoy Creek; (4) the cost of the pump and treat at Charlevoix was estimated to be $4.8 million, the EV pump and treat is estimated to cost $1.6 million.

At the Cliffs-Dow Dump site, there was no unacceptable risk from the groundwater, which is why no active remediation was required. At Cliffs-Dow the risk due to groundwater was estimated to be 3.3X10-6, which is at the very protective end of the U.S. EPA's risk range of 1X10-4 and 1X10-6. At the EV site, the groundwater poses a significant risk to human health and the environment. The carcinogenic risk associated with future residential use is calculated to be 4X10-4, and the hazard index was calculated to be 18.

At the Wheeler Pit site, for reasons including the fact that there were no Maximum Contaminant Level (MCL) exceedences in the groundwater, no active remediation was required. At the EV site there are MCL exceedences for vinyl chloride, benzene, ethylbenzene, toluene and trichloroethylene.

The issue of remediation of the off-property groundwater will be fully addressed in the final ROD for this site.

Comments from EV

Proposed Plan

1. Comment. The [potential future] risk associated with the former lagoon area is $1x10^{-5}$ and non carcinogenic risk of 0.8. These risks are in the range not warranting remedial action according to OSWER Directive [9355.0-30 dated April 22, 1991] and makes it unclear as to why a full Michigan Act 64 cap is proposed for this area.

   Response. Per 40 CFR 300.430(e)(2), as cited in the Risk Assessment Guidance for Superfund (RAGS) Human Health Evaluation Manual Part B dated December 1991, and distributed via OSWER Directive 9285.7-01B dated December 13, 1991, the 10^{-6} risk level is still the point of departure for determining remediation goals when ARAR's are not available or if there are multiple pathways of exposure. RAGS Part B states that "... an appropriate point of departure for remediation of carcinogenic risk is a concentration that corresponds to a [target] risk of 10^{-6} for one chemical in a particular medium." As pointed out in the guidance, the establishment of preliminary remediation goals and remediation levels is to begin at $1x10^{-6}$ for carcinogens and a hazard quotient (HQ) of 1 for noncarcinogens.

   As published in the U.S. EPA's September 10, 1991, FS for the Electro-Voice site at Tables 2-2 and 2-3 the reasonable maximum carcinogenic risk for potential exposure to surface soils in the South Lagoon is $4x10^{-5}$ and the HQ for the RME in the North Lagoon is 2. Both of those results warrant some form of active remediation according to guidance and the U.S. EPA feels that a State of Michigan's Act 64 cap on this area will adequately protect the public from potential exposure.

2. Comment. A permeable soil cap provides equal protection against direct contact and ingestion without posing the implementation difficulties and high costs associated with multi-layer caps. Why does the EPA's preferred alternative include an impermeable Michigan Act 64 cap?

   Response. U.S. EPA disagrees that a permeable cap provides equal protection from risks posed by the lagoon area soils. The common earth cap which EV proposes is very similar to the former Michigan Act 87 cap which has been replaced by the Michigan Act 641 cap. The Act 641 cap is used for closure of solid wastes and requires a minimum of two feet of compacted clay followed by a minimum of four inches of topsoil and a frost protection layer. The Michigan Act 87 cap was replaced by the 641 cap because the Act 87 cap was

only designed to last two years. U.S. EPA is concerned with protecting the public from direct contact with the lagoon area soils for a long period of time. A cap which is designed to last only two years is not adequate for long-term protection of human health and the environment.

Additionally, the cap EV proposes does not include a freeze-thaw layer, which in south-western Michigan is necessary because of the cold weather in the winter. Also, the cap that EV proposes will not keep any infiltration out of the lagoon area soils. Cadmium, which was detected at elevated levels as deep as 26 feet below the surface (the groundwater table is at a depth of 29.5 feet), is one of the more mobile metals, and it is conceivable that the cadmium in these soils could reach the groundwater table. Therefore in order to protect the groundwater from leaching of the contaminants in the lagoon area soils, an impermeable cap is necessary.

3. Comment. The U.S. EPA's Preferred Alternative involves the excavation of contaminated soils in the dry well prior to any treatment. If the soils are first treated by vapor extraction and enhanced bioremediation the result would be more waste treated and less waste transported and landfilled satisfying the NCP's preference for treatment and reducing short-term risks of exposure during remediation.

Response. The excavation proposed in the dry well area was for the removal of the "sludge-like" layer of highly contaminated soils that has complex organic compounds and metals in it that are probably not volatile enough to be affected by vapor extraction and have not been shown to be affected by in-situ biological treatment. The U.S. EPA's preferred alternative takes these facts into account and shortens the time in which, and improves the chances that, the dry well area will meet clean up goals if the "sludge like" layer is removed prior to vapor extraction and bioremediation. The short-term risks associated with either action are comparable and fugitive emissions during either action would have to be monitored and controlled to minimize risks to workers and adjacent properties.

U.S. EPA has made it clear, however, that the order in which the technologies are applied to the dry well area soils (e.g., SVE then excavation or excavation then SVE) is not the Agency's main concern. U.S. EPA's goal is to clean up the EV site to the cleanup standards which are set forth in the Record of Decision in as short a timeframe as possible in order to protect human health and the environment.

4. Comment. The U.S. EPA has suggested that institutional controls and natural attenuation are not reliable as a sole source for groundwater protection, but was accepted as the preferred alternative at similar sites in Wisconsin (Wheeler Pit), Minnesota (Burlington Northern), and two in Michigan (Cliffs-Dow and Charlevoix) all within U.S. EPA Region V. The city government and citizens of Buchanan have expressed their confidence in institutional controls to protect against exposure to [off-site] contaminated groundwater.

Response. The NCP (since SARA 1986) gives preference to alternatives that treat contaminants rather than relying on institutional controls and attenuation via dilution or transfer to another environmental media. The reauthorization of CERCLA in 1986 (SARA) included mandates that institutional controls alone are not sufficient to protect the public health in the long term. Active remediation in concert with institutional controls not only shortens the timeframe that institutional controls need to be relied upon to prevent potential exposure but also serves as a reminder that the groundwater should not be used.

On January 24, 1992, U.S. EPA met with EV's contractor to discuss these Records of Decisions (RODs). The contractor agreed that since the Burlington Northern ROD was pre-SARA (pre-1986), it was not relevant to the EV site. The contractor, however, did argue that the Charlevoix ROD, which is also a pre-SARA ROD was relevant to the EV site. Charlevoix, however, can be distinguished from EV for the following reasons: (1) Charlevoix is a pre-SARA ROD, and SARA established U.S. EPA's current groundwater policy, which is to restore usable groundwaters to their beneficial uses whenever practicable; (2) no source of groundwater contamination was located at the Charlevoix site; at EV the source of groundwater contamination has been identified; (3) the aquifer thickness at Charlevoix was approximately 100 feet thick, which means the volume of water that required treatment was significant relative to the volume of water that requires treatment at EV where the aquifer is 50 feet at the EV property, but narrows down to 10 feet by McCoy Creek; and (4) the cost of the pump and treat at Charlevoix was estimated to be $4.8 million, and the EV pump and treat is estimated to cost $1.6 million.

At the Cliffs-Dow Dump site, there was no unacceptable risk from the groundwater, which is why no active remediation was required. At Cliffs-Dow the risk due to groundwater was estimated to be 3.3X10-6, which is outside the U.S. EPA's risk range of 1X10-4 and 1X10-6. At the EV site, the groundwater poses a significant risk to human health and the environment. The carcinogenic risk associated with future residential use is calculated to be 4X10-4.

At the Wheeler Pit site, for reasons including the fact that there were no Maximum Contaminant Level (MCL) exceedences in the groundwater, no active remediation was required. At the EV site there are MCL exceedences for vinyl chloride, benzene, ethylbenzene, toluene and trichloroethylene.

The issue of remediation of the off-property groundwater will be fully addressed in the final ROD for this site.

5. Comment. The U.S. EPA Preferred Alternative as a whole does not provide any significant additional protectiveness over the EV alternative.

Response. The selected remedy for the first operable unit does not vary significantly from the EV proposal. The difference between the remedy selected for the first operable unit and the EV proposal is that EPA's alternative calls for a hazardous waste cap over the lagoon area soils and EV's proposal calls for a "common earth" cap over the lagoon area soils. The added protectiveness and benefits of the hazardous waste cap are discussed in Comment Number 2 in this section of the Responsiveness Summary.

The second operable unit will address a final remedy decision for the off-property groundwater.

U.S. EPA-prepared Feasibility Study (FS) Report

1. Comment. Why did the U.S. EPA chose to have the FS totally re-written at additional cost when the alternatives presented in the U.S. EPA FS are only slightly different than the alternatives presented in the EV FS.

Response. U.S. EPA's disapproval of EV's FS report occurred after EV exercised its right to formally dispute U.S. EPA's disapproval of EV's FS report. U.S. EPA disapproved a draft Feasibility Study (FS) report which was prepared by EV on November 15, 1990, for reasons including the following: failure to contain any remediation goals, a fundamental component of the FS which is required by the NCP; uncertainty with the accuracy of alternative costs and time to reach cleanup goals; a lack of detail regarding specific components of some of the alternatives (e.g., bioremediation of dry well area soils and groundwater, in-situ vitrification of dry well area soils, discharge of treated groundwater to a publicly owned treatment works); failure to analyze applicable or relevant and appropriate requirements (ARARs) which were identified to EV, specifically the Michigan Act 307 rules; and concern by the Agency regarding EV's interpretation of the NCP, which is inconsistent with U.S. EPA's interpretation of the NCP. U.S. EPA advised EV in a meeting and a letter dated November 15, 1990, that if

all U.S. EPA's comments were not incorporated into the final FS report, the Agency would consider exercising its options under the Administrative Order by Consent (AOC) which EV entered into with U.S. EPA on October 15, 1987.

The final FS report which EV prepared was not satisfactory and was subsequently disapproved on February 28, 1991. At that time, U.S. EPA informed EV that the Agency would exercise its options under the AOC and complete the FS report.

The final FS report which EV prepared was not satisfactory because it failed to adequately incorporate ARARs; failed to adequately address risks associated with future use of groundwater; failed to screen response-unit-specific alternatives in accordance with the NCP and U.S. EPA guidance; failed to bring a comprehensive groundwater cleanup alternative to the detailed analysis; and failed to conduct the nine criteria analysis in accordance with the NCP and Agency guidance.

U.S. EPA did not have the Feasibility Study (FS) report "totally rewritten" as the commenter suggests. U.S. EPA completed the FS using the acceptable portions of the FS report prepared by EV in an effort to keep the costs of completing the report to a minimum and in an attempt reach a final remedy decision as expeditiously as possible.

2. Comment. The actual remedial goals are not clearly presented in the FS and the potential remedial goals presented in Appendix D are numerous and there is no explanation of how they were developed nor which ones were selected.

Response. The Potential ARARS are discussed in Chapter 3, Appendix A, and Appendix D of the FS and are compared to the chemical specific concentrations of the various contaminants observed in environmental media sampled during the EV RI and FS. Appendix Tables D-1 through D-4 show which contaminant concentrations exceed which potential chemical specific criteria and the method or regulation used for developing that criteria. The goals selected for purposes of developing comparative estimates for alternative evaluation in the FS were those that were the most protective of human health or the resource. For the most part the most conservative goals were those developed using the method for calculating Michigan Act 307 Type B and Aquifer Protection criteria. The references for the derivation of the potential chemical specific ARARS are given in the FS and compared to observed concentrations from the Remedial Investigation performed by EV.

3. Comment. The FS eliminates in situ bioremediation of the soils and groundwater as a potentially applicable technology during the technology screening step citing that it has limited potential for remediating chlorinated VOC's. Bioremediation could, however, be effective for many compounds in the dry well area including semivolatile compounds that are difficult to remediate with any other technology and appears to be an excellent complement to SVE and should be retained.

Response. The dry well area soils have a number of semivolatile organic compounds such as polyaromatic hydrocarbons (PAH's) that have been shown in the literature to be resistant to in situ biodegradation and only sparingly biodegradable under ex situ laboratory conditions where temperature, nutrients, oxygen, and moisture can be controlled. Even under those conditions the degradation is slow and the reduction in concentration is usually not as low as required to meet health criteria. Also, the conversion products of bioremediation can be more toxic than the initial compound, such as the degradation of the chlorinated volatile organic compounds PCE and TCE to 1,1-DCE and vinyl chloride, which are considered to be more carcinogenic than their precursors.

4. Comment. Page 5-3 of the FS report does not explain why enforcement of well use restrictions would be difficult. The EV site is a good place for the successful implementation of institutional controls since all residents are connected to the city water supply and the city has the authority and commitment to ensure the successful implementation of the well use restriction controls.

Response. U.S. EPA will be relying on a combination of institutional controls and active remediation of the soils and on-property groundwater during the implementation of this operable unit. The issue of institutional controls will be further addressed in the second operable unit ROD for this site.

5. Comment. On page 6-8 of the FS report it is stated that Alternative 4A's long-term effectiveness would be greater than that of Alternatives 3A and 3B because it would not rely on institutional controls to limit exposure to the downgradient plume. This statement is not correct because institutional controls are the only exposure-limiting control used in all of the ground-water cleanup alternatives until remedial action goals are met."

Response. U.S. EPA will rely on institutional controls during the remediation timeframe in all of the alternative presented in the FS. The context of the statement on page 6-8 of the FS is in the section "Long-term Effectiveness and Permanence." The statement is true in the context intended in that Alternative 4A is comparatively more effective in the long-term in limiting potential exposure than Alternatives 3A and 3B. This is because the groundwater under Alternative 4A would be actively pumped and treated to remove contaminants which will decrease the time period in which Alternative 4A would achieve protection of human health and the environment from the time it will take to achieve these same goals for Alternatives 3A and 3B.

The issue of remediation of the off-property groundwater will be fully addressed in the final ROD for this site.

6. Comment. It is unreasonable to install a Michigan Act 64 cap over the dry well area when Type B levels are the goal and it is unreasonable to expect that Type B levels can be attained without the use of [in situ] bioremediation technology. A Type C closure for the dry well area should be pursued if any capping is to be used.

Response. The capping of the dry well area is included in the alternatives in the event that Michigan's Act 307 Type B cleanup standards cannot be met with the technologies proposed. The report does not state that this will be a definite part of any of the alternatives, but contemplates closure or other appropriate actions to be determined by the Agencies if the technologies chosen cannot meet the cleanup standards. The reasonableness or unreasonableness of not using bioremediation depends on the target contaminants response to in situ bioremediation. As mentioned previously in Comment 3 in this section, many of the contaminants observed in the dry well area are not expected to be amenable to in situ bioremediation.

7. Comment. On page 5-2, the FS report states that "the lagoon area soil contains high levels of heavy metals." The term "high levels" is imprecise. The FS also states that soil washing or solidification may be required to minimize the need for long term maintenance. Since the lagoons have been in their present state since 1980 and ground water monitoring has not indicated that the metals are leaching and appear to be immobile, neither soil washing or solidification would be necessary.

Response. The terms "high levels of heavy metals" is in direct reference to the existence of concentrations of heavy metals in the lagoon area soils higher than those observed in background soils (see page 2-6 of the FS) and at levels that constitute a potential future risk to public health (see Tables 2-2 and 2-3 of the FS). The reference to soil washing or solidification was made to point out the problem that to achieve potential remediation goals a large volume of soil may have to be excavated and that soil washing or solidification may reduce that volume.

In regard to the mobility of the metals in the lagoon area soils, sampling conducted during the remedial investigation (RI) show that the metals in the lagoon area soils are not immobile. It is true that the contaminants have not yet reached the groundwater, however sampling conducted during the RI shows elevated levels of cadmium (above background) at depths of 26 feet in the lagoon area soils, arsenic and lead at depths of 23.5 feet. The groundwater table is located at 29.5 feet below grade. Since the former lagoons were reported to be approximately 10 feet deep and clay lined, the sampling in the lagoon area indicates that the contaminants which remain in the soils are migrating toward the groundwater table.

8. Comment. The FS on page 5-4 indicates that the "sludge-like" material may not be a RCRA hazardous waste. The commenter argues that once the sludge is removed it is a RCRA hazardous waste and will likely be RCRA characteristic which would subject it to Land Disposal Restrictions (LDRs) prior to disposal. The commenter believes incineration would be required under this scenario. The EV FS report contemplated in-situ treatment of the dry well area soils prior to excavation in order to avoid the requirement of incineration.

Response. Based on the information that U.S. EPA has on what was disposed in the dry well area, the dry well area soils are not considered to be RCRA hazardous waste. If some of the sludge layer is removed it will be tested to determine if it is RCRA characteristic prior to disposal. If the sludge is RCRA characteristic it will be subject to Land Disposal Restrictions (LDRs) prior to disposal. LDRs do not require incineration, however. LDRs require that waste be treated prior to disposal in a RCRA-approved landfill. This pretreatment requirement is identified in the FS as solidification prior to land disposal.

The commenters' contention that EV's purpose in treatment of the soils prior to excavation does not change the fact that the sludge may test RCRA characteristic. The purpose of treatment prior to excavation is to reduce the volume of

sludge that will be required to be removed. Even the EV FS report recognized that with in-situ treatment first there will be a good possibility that some sludge will be required to be excavated and will be RCRA characteristic.

9. Comment. Once the removal and SVE actions taken at the dry well area are completed the determination of the need for a RCRA-type cap should be based on the levels of residual contamination. Since any residual contamination remaining after sludge removal would be low levels of nonvolatile contaminants located in the subsurface, exposure by receptors would not seem to be a substantial threat.

   Response. The design of the remedial actions for the dry well area will include performance monitoring requirements (soil sampling) that will show if the residual contamination remaining after excavation and SVE of the dry well area warrants capping with a RCRA-type cap. It is impossible at this time to conclude that the residual contamination remaining after sludge removal will be "low" enough to not be a "substantial threat".

10. Comment. On page 6-8, Alternative 4A, the effect on McCoy Creek of constructing and operating a groundwater purge and treatment system in close proximity to the creek banks is not discussed. The offsite operation of an air stripper and effluent discharge to McCoy Creek also in Alternative 4A at page 6-9 does not address the effect the permitting process would have on implementability.

    Response. The location of the groundwater wells and treatment system will be determined during design. The location will be selected such that there will be no adverse impacts to McCoy Creek. The FS recognized the need to meet permit requirements for the treatment system and discharge and does state that fact on page 6-9.

    The issue of placement of any off-property groundwater treatment components will be further addressed in the final ROD for this site.

11. Comment. The FS does not appear to include the cost for carbon disposal for carbon used in the groundwater treatment system, and at other remediation sites with listed hazardous wastes as the source of groundwater contamination the carbon is presumed to be hazardous which raises the transportation and treatment disposal costs.

Response. Based on the information currently available, the U.S. EPA does not consider the dry well area soils, which are the source of the groundwater contamination, to be RCRA listed wastes. Therefore, the contaminated groundwater is not currently considered to be RCRA listed waste either. The carbon costs used in the FS cost estimates include regeneration and replacement by the carbon supplier. If, upon further characterization during design and bench scale testing, the carbon is considered a RCRA characteristic waste, the cost estimate may or may not increase depending upon the supplier selected.

12. Comment. The FS did not include the costs of POTW treatment as part of the cost calculation for those alternatives.

Response. The cost of POTW treatment is usually based on flow and strength, usually measured as BOD or COD. The flow to be treated from the EV on-site treatment system will be small compared to the flows of municipal sewage entering the POTW and the treated effluent from the site will have no BOD or COD remaining and will meet the pretreatment requirements of the POTW once established. Since there has been no previous discharges of carbon treated waste streams discharged to the POTW there is no basis for the development of costs and no estimate of costs could be developed.

Applicable or Relevant and Appropriate Requirements (ARARs)

1. Comment. The commenter suggests that page A-3 of U.S. EPA's Feasibility Study (FS) Report (September 10, 1991) should state that Maximum Contaminant Levels (MCLs) are ambient standards for drinking waster sources which apply regardless of whether there is a planned discharge or not.

Response. U.S. EPA's Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, EPA/540/G-88/003, December 1988, states on page 4-3 that "[t]wo kinds of standards are considered ARARs for remediation of ground water that is current or potential drinking water when they are available: MCLs and promulgated State standards..." MCLs are enforceable standards set for public water supply systems promulgated under the Safe Drinking Water Act (SDWA). Generally, they are relevant and appropriate for groundwater that is a current or potential source of drinking water, but are applicable at the drinking water tap if there are at least 25 users or 15 service connections to a public water supply system.

2. Comment. The commenter states that on page A-3 of EPA's FS Report the statement that secondary MCLs are enforceable under Michigan's Act 307 is not necessarily accurate because under Michigan's Act 307 the type of cleanup can vary and since secondary MCLs are only one factor used in the calculation of Type B standards, secondary MCLs are not "enforced" under Act 307.

Response. Michigan's Act 307 Rules identify secondary MCLs as an enforceable Type B cleanup standard. See MERA 1982 P.A. 307 as amended, et.seq. MCL R 299.5709(2)(c).

3. Comment. The commenter argues that the statement on page A-3 of EPA's FS report that the determination of the point of compliance for groundwater is the entire aquifer is not a correct determination. The commenter states that for remedial actions which involve containment or institutional controls, the point of compliance would be at the edge of the containment area or the edge of the control zone.

Response. U.S. EPA disagrees with the commenters' analysis regarding the point of compliance for groundwater. The preamble to the NCP states that "...for groundwater, remediation levels should generally be attained throughout the contaminated plume, or at and beyond the edge of the waste management area when waste is left in place." 55 FR 8753. The provision for wastes left in place generally refers to a situation where landfill closure will occur and the landfilled wastes are the source of the groundwater contamination and will remain in place. This is not the case at the EV site because the only wastes which will be left in place at the site are the lagoon area soils, and these soils are not currently a source of groundwater contamination.

In addition, U.S. EPA's Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, EPA/540/G-88/003, December 1988, states on page 5-9, Section 5.4.1 that "[a] rapid remedial alternative generally should be developed for ground water that is a current or potential source of drinking water. This alternative should achieve the selected cleanup level throughout the area of attainment within the shortest time technically feasible. Additional alternatives should be developed to ensure that a wide range of distinctive hazardous waste management strategies are evaluated at most sites. Natural attenuation to health-based levels often is a baseline alternative for comparison with other alternatives."

4. Comment. The commenter states that RCRA Subtitle C is not applicable to the lagoon area soils, in opposition to page A-4 of U.S. EPA's FS report. The commenter also states that it would be helpful if the FS had separated the ARARs discussion for the lagoon area soils and the dry well area soils.

   Response. U.S. EPA agrees that RCRA Subtitle C is not applicable to the lagoon area soils. 40 CFR 264.94 and 264.100 requirements in Subtitle C of RCRA are relevant and appropriate since they regulate circumstances sufficiently similar to those at the site. The wastes which EV disposed in the former lagoons are described in the final RI report (August 1990) as "liquid waste from the electroplating operation at the plant." These wastes are sufficiently similar to RCRA listed wastes F006, F007 and/or F008, which are wastes associated with electroplating operations. The hazardous waste closure regulations are applicable to the lagoon area soils because the purpose of closure of this area is to provide long-term protection of human health and the environment, specifically from direct contact or gardening in these soils at a future date. In addition, cadmium, which was very elevated in the lagoon area soils and was detected above background levels in the soil column at 26 feet deep (groundwater table is at 29.5 feet deep), is one of the more mobile metals, and could pose a threat to groundwater in the future.

5. Comment. The commenter states that RCRA flood plain location standards (40 CFR 264.18(b)) are not ARARs as noted in Table A-1 of the U.S. EPA's FS report because a surface water discharge of treated groundwater to McCoy Creek will require an NPDES permit, and as an NPDES discharger, the wastewater treatment unit will qualify for an exemption from RCRA requirements under 40 CFR 264.18(b). Therefore these RCRA requirements are not ARARs.

   Response. U.S. EPA agrees with the commenter that 40 CFR 264.18(b) is not an ARAR for point source discharges to a surface water body if the discharge is conducted under an NPDES permit.

6. Comment. The commenter states that the OSWER directive 90355.0-28 which is identified as an ARAR in Table A-2 of U.S. EPA's FS report is actually a to-be-considered (TBC) because it is a directive as opposed to a regulation.

   Response. U.S. EPA agrees that directives are TBCs and not ARARs.

7. Comment. The commenter suggests that in Table A-2, sheet 2 of 6 in the U.S. EPA FS report, the capping requirements for waste piles and landfills are not relevant and appropriate as indicated in the Table. The commenter is also confused about the term "applicable" which appears in the ARAR column of Table A-2 under the capping ARARs. The commenter additionally states that 40 CFR 264.228(a)(2) is not an ARAR because it refers to the elimination of free liquids in a surface impoundment.

Response. U.S. EPA agrees that capping requirements for waste piles and landfills as identified in Table A-2 of the FS are not ARARs for the lagoon area soils. The term "applicable" which appears in the ARAR column indicates that if the wastes were disposed in the former lagoons were RCRA listed wastes or are RCRA characteristic, RCRA capping requirements would be applicable. U.S. EPA agrees that 40 CFR 264.228(a)(2) is not an ARAR.

8. Comment. The commenter suggests that in Table A-2, sheet 5 of 6, under disposal of hazardous wastes, that the U.S. EPA's offsite policy should be referenced.

Response. U.S. EPA's off-site policy is Directive No. 4.11a and became effective on 1/4/88. The off-site policy is a TBC.

9. Comment. The commenter suggests that in Table A-2, sheet 6 of 6 in the U.S. EPA's FS report that the comment in the operation and maintenance, post-closure care should read "[t]he post-closure requirements may be applicable to the dry well area if the cleanup goals are not met," as opposed to "[t]he post-closure requirements will be applicable."

Response. U.S. EPA disagrees that Table A-2 needs to be revised in accordance with the commenter's suggestion. It is clear in the Record of Decision that closure or some other remedial action will be considered for the dry well area only if cleanup standards are not met. Therefore, if cleanup standards are met in the dry well area, no additional remedial action will be considered and the post-closure care requirements will be moot.

State ARARs

10. Comment. The commenter states that it is unclear from the discussion on page A-6 of U.S. EPA's FS report if Michigan's Hazardous Waste Management Act (Act 64) is an ARAR.

    Response. Michigan's Act 64 is clearly identified as an ARAR in Table A-3, sheet 2 of 5 in U.S. EPA's FS report.

11. Comment. The commenter requests clarification to references made to A.1.1, A.1.2 and A.1.3 in Table A-3, sheet 1 of 5 in U.S. EPA's FS report.

    Response. The references referred to in the comment are notes which the preparer of this section made in the working draft version of the report and should have been removed in the final version. These references should be disregarded.

12. Comment. The commenter states that in Table A-3 of U.S. EPA's FS report, Michigan's Act 64 is listed as not an ARAR because it is equivalent to a federal requirement. The commenter states that in some aspects the Michigan Act 64 is more stringent than the federal law and thus should be noted as being an ARAR.

    Response. U.S. EPA agrees that Michigan's Act 64 is an ARAR for the EV site.

13. Comment. The commenter states that in Table A-3 of U.S. EPA's FS report the Table should be more specific regarding which actions coincide with which ARAR.

    Response. There is no requirement that an FS report, in table format, be specific in identifying which actions coincide with which ARAR.

14. Comment. The commenter states that in Table A-3, sheet 2 of 5 of U.S. EPA's FS report, no determination is made as to whether Michigan's Act 64 Leak Detection System (R 299.9622) is an ARAR or not, and the commenter believes it should not be an ARAR.

    Response. U.S. EPA agrees that the Leak Detection System portion of Michigan's Act 64 is not an ARAR.

15. Comment. The commenter states that there appears to be an inconsistency in Table A-3, sheet 4 of 5 and sheet 1 of 5 of U.S. EPA's FS report. Both pages of Table A-3 list R 299.9602 - General Environmental and Human Health Standards, but one reference states it is an ARAR, the other reference states it is not an ARAR.

Response. The reference to R 299.9602 - General Environmental and Human Health Standards on sheet 1 of 5 should indicate that this regulation is an ARAR.

Groundwater

1. Comment. The estimations of specific capacities were not calculated properly. The full saturated thickness should have been used to calculate aquifer transmissivity. The results of these errors is the overestimation of drawdown and capture zone widths.

   Response. The specific capacities, which were calculated using the effective aquifer thickness, were calculated correctly. The effective aquifer thickness (initial saturated thickness minus drawdown) was used to calculate transmissivity in the FS. If transmissivity was held constant in the calculation (i.e., if the decrease in saturated thickness caused by pumping was ignored), hydraulic conductivity, which is the quotient of transmissivity and saturated thickness, would increase as saturated thickness decreases. This apparent increase in hydraulic conductivity would give an over-optimistic sense of well yield.

2. Comment. Equation B-1 on page B-2 of U.S. EPA's FS report was not used properly. The equation calls for a saturated thickness of the aquifer that has not been affected by pumping from the extraction well. For the onsite extraction well capture zone calculations, the saturated thickness should have been approximately 55 feet.

   Response. The point raised by the commenter in general is valid, however expected geologic conditions at the EV site suggest that use of the full aquifer thickness will induce error into the calculation of capture zone width. The on-property extraction well considered in U.S. EPA's FS only penetrates the upper (most contaminated) part of the aquifer. In an ideal situation, where hydraulic properties of the aquifer are uniform, both horizontal and vertical, a partially penetrating well would induce significant vertical flow upward to the well. At the EV site, however, the vertical permeability is expected to be much less than horizontal permeability, restricting the amount of vertical flow that would be expected. These effects would make the use of a full saturated thickness value for calculating the capture zone of a partially penetrating extraction well overly conservative. The U.S. Geological Survey reports that the ratio of $K_{vertical}/K_{horizontal}$ generally ranges from 0.1 to 0.5 in outwash deposits, and reports a value of 0.1 for an aquifer test at Howe, Indiana, which is in a similar geologic setting as Buchanan, Michigan (Peters, J.G.,

Description and Comparison of Selected Models for Hydrologic Analysis of Ground-Water Flow, St. Joseph River Basin, Indiana, U.S. Geological Survey Water-Resources Investigations Report 86-4199, 1987).

3. Comment. The calculations for the volume of aquifer purged by the onsite extraction well system are not correct. The wells will extract groundwater from the entire aquifer and not just the upper 10 or 15 feet where the majority of contaminants are found. This is true even for wells screened in the upper portions of the aquifer, assuming that the aquifer does not have low vertical hydraulic conductivity layers within it.

   Response. The U.S. EPA disagrees with this comment because the presence of relatively low vertical permeability will restrict the amount of vertical groundwater movement near the on-property extraction well. Refer to response to comment 2 in this section for additional information.

4. Comment. The proposed offsite extraction well has a capture zone width of 892 feet according to the FS, which is wider than the average capture width of 736 feet used in the calculation. The result is that it will take longer to purge the aquifer given the designated extraction well system than U.S. EPA has estimated.

   Response. The point made by the commenter about the capture zone width is valid. The confusion reflected in this comment was caused by an attempt to add a measure of conservatism to the relative remediation time estimates presented in the FS. It is expected that, during the predesign phase, extraction wells would be positioned so the capture zone width would coincide with the width of the contaminant plume. The reason for adding a measure of conservatism to this calculation is to recognize that pore flushing caused by groundwater movement (either under pumping conditions or under natural flow conditions) is not 100 percent efficient. In other words, when a pore volume of groundwater is removed from the contaminated zone and replaced with "clean" groundwater, not all pore spaces are completely flushed.

   Because of the tortuous shape of pore spaces in a granular porous medium such as that at the Electro-Voice site, many dead-end pores exist that would not be flushed by advection (groundwater movement). Instead, contamination in dead-end pores would be removed by molecular diffusion into pores that are actively flushed by groundwater movement. It was assumed that 70 percent of the porosity in the aquifer would flushed by exchanging each pore volume.

In retrospect, a clearer way to present this factor would be to reduce the rate of groundwater removal (both in the pumping and non-pumping alternatives) by 30 percent, thereby reducing the efficiency of flushing to 70 percent rather than 100 percent. The combined pumping rate for the 5 extraction wells considered in the FS would be reduced from a total of 60 gallons per minute (gpm) to 0.7 x 60 gpm, or 42 gpm (equivalent to 3.0 million cubic feet/year). Using the value for hydraulic conductivity identified by the commenter of 620 gal/day/ft^2 and accounting for inefficiency in flushing pore spaces, the flushing rate for the non-pumping alternative would be reduced from 55,700 gallons per day (gal/day) to 0.7 x 55,700 gal/day, or 39,000 gal/day (equivalent to 2.0 million cubic feet/year). The overall effect of this revised approach on estimated clean up times is summarized at the end of the EPA's response to the last comment.

5. Comment. The comparison between the cleanup times for the proposed offsite extraction wells and from natural attenuation are not correct. Furthermore, hydraulic conductivity values for the natural attenuation scenario are inconsistent with the purging scenario. In addition, the hydraulic gradients presented in the FS are very subjective and can vary significantly according to the precise measuring point.

Response. This comment includes several topics, but its focus is on two hydraulic properties of the aquifer: hydraulic conductivity and hydraulic gradient. Hydraulic conductivity, sometimes called permeability, is a measure of the ease with which groundwater moves through the aquifer. Hydraulic conductivity is an unusual property because it varies over a tremendously wide range in nature: more than nine orders of magnitude from a value of 10^{-4} gallons/day/ft^2 for massive clay to 10^5 gallons/day/ft^2 for clean gravel. In general, values for hydraulic conductivity that lie within the same order of magnitude are considered to be similar. The commenter points out an apparent discrepancy in hydraulic conductivity values in the FS, because the F.S. used a value of 620 gallons/day/ft^2 for one alternative and 439 gallons/day/ft^2 for another. Different values were used in the FS to account for slightly different areas covered by the two alternatives being considered.

As described in the RI Report, the range in measured hydraulic conductivity values at the site varied by a factor of almost 8; from 335 gallons/day/ft^2 to 2,550 gallons/day/ft^2. Viewed in this context, the two values used in the FS, which differ by a factor of about 1.4, should be considered to be essentially the same number.

Hydraulic gradient, which is the driving force that causes groundwater to flow, is estimated by dividing the difference in groundwater elevations in wells located along the same flow path by the distance between the wells. Hydraulic gradient can be viewed as analogous to the slope of a hillside. Rainfall runs off a steep hillside more quickly than a gentle hillside. Similarly, groundwater flows more quickly under the influence of a steeper gradient than a gentle gradient. Just as the magnitude of the slope on a hillside varies from point to point, so does the magnitude of the hydraulic gradient. As pointed out by the commenter, the choice of hydraulic gradient can be subjective and can vary significantly, depending on the choice of measuring points in the particular portion of the aquifer being considered.

The commenter points out that, using the available data, it is possible to calculate steeper gradients from those presented in the FS, which have the effect of increasing the estimated rates of groundwater flow and pore volume flushing under natural conditions. It is also possible to calculate more gentle gradients from the available data, which would have the effect of decreasing the estimated rates of groundwater flow and pore volume flushing. U.S. EPA believes that the values of hydraulic gradient used in the FS are reasonable for comparison purposes.

6. Comment. The methods used to calculate pore volume exchange time for the pumping and nonpumping alternatives are not consistent. An alternate and more reliable and consistent method is to determine the velocity of ground water under pumping and non pumping conditions.

Response. Insufficient information was provided during the public comment period, regarding the actual equations and assumptions used by the commenter, to evaluate the validity of the calculations described in Comment 7. On the basis of additional documentation provided by the commenter subsequent to the public comment period, an arithmetic error in the derivation of the operative formula may account for the counter-intuitive conclusions reached using the commenter's formula (which show that pumping as much as 1,000 gallons per minute has a very small effect on pore volume flushing time compared to no pumping at all). In any water budget analysis, mass must be conserved. For this case, the water pumped by the extraction wells must be supplied by the aquifer lying within the capture zone of the extraction wells. The total discharge from the extraction wells therefore would equal the total flux of groundwater through the capture zone. A volumetric calculation comparing the volume of aquifer flushed by the extraction wells and the discharge rate from the extraction wells

provides a reliable estimate of the pore volume flushing time in the contaminated zone. The authors of the reference cited by the commenter in the additional information submitted after the end of the public comment period (Javendel, I., and C.F. Chang, Capture-Zone Type Curves, A Tool for Aquifer Cleanup, Groundwater, v. 24, n. 5, pp. 616-625) use the same method of calculating pore volume flushing times on a volumetric basis as U.S. EPA did in the FS.

A fundamental problem with using the hydraulic gradient values provided in the Remedial Investigation (RI) Report is that it is not known how the gradient varies over time. An implicit assumption of the non-pumping alternative is that the hydraulic gradient values calculated from RI data are reasonable estimates of long-term hydraulic gradients. Hydraulic gradients vary over time because of the effects of seasonal variations in pumping, recharge, and stream flow. One advantage of installing extraction wells is that wells allow the hydraulic gradients to be controlled to some degree by varying pumping rates. Under the non-pumping alternative, nothing can be done to influence hydraulic gradients. If long-term average hydraulic gradients turn out to be gentler than currently estimated gradients, the actual pore volume flushing time could be longer than estimated by the commenter. Conversely, if long term average gradients turn out to be steeper than current estimates, actual pore volume flushing times could be shorter.

7. Comment. The equation to estimate off-site cleanup times as presented on page B-56 of the FS is incorrect but was used in its proper form. Using a method developed for another Superfund site in Michigan by E.C. Jordan, Inc. ground-water velocities were recalculated and a different retardation factor was developed and the cleanup times recalculated, assuming a TCE concentration of 76 ug/l for natural attenuation and pumping alternative. The results are 9.55 years and 9.14 years respectively pointing out no appreciable difference between the two alternatives.

Response. Accurate prediction of groundwater contaminant concentrations versus time requires simulation of complex physical and geochemical processes. These processes include contaminant partitioning between groundwater and the aquifer skeleton and other sorption sites such as particulate organic carbon and metal hydroxides; mixing processes such as dispersion and diffusion; dilution by recharge; chemical reactions such as precipitation, volatilization, hydrolysis, and chelation; cosolvent/common ion effects; and biological degradation. The relatively simple calculations used to make these estimates required numerous assumptions to make the problem tractable. The usefulness of this method is its

ability to estimate relative contaminant behavior under different remediation alternatives.

The equation used in the FS to predict the rate of contaminant removal by the various groundwater remediation alternatives assumes that "equilibrated" groundwater containing contaminants is removed from the contaminated portion of the aquifer as a slug (i.e., no dispersion, diffusion, or dilution with recharge). Groundwater free from contaminants then moves into the aquifer to fill the pore space (one pore volume). Desorption equilibrium as described by a linear isotherm with a constant distribution coefficient is assumed to occur between the aquifer skeleton and the groundwater. The equilibrated groundwater containing contaminants is then removed from the contaminated zone and the process repeated. Each groundwater pore volume removes contaminants from the system, thus reducing the total mass of contaminant in the system.

The relative decrease in contaminant mass (or concentration) with each pore volume is constant. In other words, for each pore volume, the same ratio of mass is removed from the system, but the total mass removed by each successive pore volume is less. This constant reduction in contaminant mass can be described by the first order exponential decay equation used in the FS.

The commenter correctly points out that this method ignores such effects as biodegradation and volatilization. These processes were not considered in the FS because they cannot be readily estimated using data from the site or from the published literature. The relative comparability of the various alternatives should have been affected about equally by ignoring these processes for each alternative considered.

The commenter attempted to account for these effects by deriving a so-called "R" value (retardation value) from the distribution of TCE at the site. The value obtained by the commenter is not a true retardation factor; it contains the effects of a variety of processes, including: dilution by recharge; dispersion; volatilization; sorption/desorption; biodegradation; and variable contaminant loading to the system caused by changes in disposal practices over time.

It is important to keep in mind that the equation used in the FS calculates TCE removal rates on the basis of the total mass of TCE in the system. The commenter has not shown that use of an exponential decay equation is appropriate for describing the effects of the various processes (other than sorption/desorption) that effect TCE concentrations at the site. For example, a contaminant

source that varies in strength over time is random with respect to the total mass of TCE in the system, yet it can account for a large part of the areal variation in TCE concentrations at the site.

The method of using measured values to back-calculate input parameters to an equation is referred to as an "inverse problem". Inverse problems are mathematically unstable because small errors in measurements can lead to large errors in parameter estimations. Moreover, if the processes effecting the magnitude of the measured values are poorly understood, illogical results can be obtained. To see how this could occur, consider the hypothetical case of the concentration of chloride in groundwater downgradient of a municipal landfill. Typically, chloride concentrations are high on the edge of the landfill, and decrease substantially downgradient of the landfill because of dispersion and dilution by recharge. Using the method to calculate retardation values proposed by the commenter, one would conclude from the data that chloride has a very large retardation factor. In fact, chloride is a relatively conservative ion that is considered to move at about the same rate as groundwater (i.e., no retardation).

The retardation value for TCE of about 1.4 proposed by the commenter is unusually low. Based on EPA's experience at similar sites the retardation value of about 3 for TCE used in the FS is near the low end of the range of retardation values commonly derived for TCE and is considered to be reasonable.

The groundwater remediation time estimates presented in the FS were recalculated using the efficiency factor described in a previous comment response (70 percent) and the value of hydraulic conductivity preferred by the commenter (620 gallons/day/ft^2). As discussed in the response to a previous comment, the estimates presented in the FS for hydraulic gradient are considered reasonable and were not changed. Similarly, the estimate of the retardation value for TCE presented in the FS is also considered reasonable and was not changed.

The revised estimates of groundwater remediation times were made on the basis of the highest trichloroethene (TCE) concentrations measured in 1990 (76 µg/L) and 1991 (41 µg/L). These times were calculated using the procedure described in the FS. Two alternatives were considered: five extraction wells pumping 60 gpm, and natural flushing with no offsite pumping. Results of these calculations are:

Alternative	Initial TCE Concentration	
	76 µg/L	41 µg/L
No Offsite Pumping	66 years	53 years
Offsite Pumping	42 years	35 years

Electro-Voice's Public Comment Submittals

1. Comment. At the top of page 7 of EV's 12/13/91 Public Comment submittal, the text states that the reasonable maximum non-carcinogenic hazard index for the lagoon area soils is 0.8, and references the Supplemental Risk Assessment for the EV Site, January 1991 (prepared by Ecology & Environment for EV).

   Response. The approved Supplemental Risk Assessment for the EV Site is dated March 1991 and in Table 12, page 5-5 indicates that the hazard index for a reasonable maximum exposure to the lagoon area soils is 2.0. U.S. EPA's Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) Interim Final, December 1989 states on page 8-13 that "[w]hen a hazard index exceeds unity, there may be concern for potential health effects." A hazard index greater than 1.0 triggers a response action under CERCLA as amended by SARA.

2. Comment. The last full paragraph on page 7 of EV's 12/13/91 Public Comment submittal states that "[a]n effective former lagoon area fence has already been installed by EV." (emphasis added).

   Response. At the public meeting which U.S. EPA held on 2/28/92 to explain the results of the Remedial Investigation, it came to the Agency's attention that local children historically and currently were playing in the former lagoon area on the EV property. Residents who played in this area as children indicated to the Agency that the area had been fenced in the past but this had not deterred the local children from accessing the area and continuing to play there. Based on this information, U.S. EPA requested that EV immediately construct a fence around this area of their property to deter children from trespassing. U.S. EPA does not consider a fence, by itself, to be an effective deterrence to children accessing this area and being exposed

to the contaminated soils.

3. Comment. The first bullet on page 8 of EV's 12/13/91 Public Comment submittal states "[a]lthough there are some relatively minor levels of residual inorganic elements in the soil in the lagoon area,..." (emphasis added).

Response. Soil contaminant levels are compared to background levels in order to determine if contaminant levels are elevated or not. Preliminary background levels for contaminants on-site were established during the remedial investigation. Five surface soil samples were taken on March 25, 1991. These results indicated that the level of arsenic was twice background in one sample, lead was detected at six times the background level and cadmium was detected at 450 times the background level. Subsurface soil sampling results also showed elevated levels of contaminants above background; specifically in sample 91388NL23 from 8.5 feet deep, cadmium was detected at 735 times the background concentration; sample SL-2-6I from a depth of 23.5 feet showed arsenic at 4 times the background level; sample SL-1-2I from a depth of 4.5 feet showed lead at a concentration of 8 times the background concentration.

BACKGROUND SOIL CONCENTRATIONS

Sample	Depth of Sample (feet)	Arsenic (mg/kg)	Lead (mg/kg)	Cadmium (mg/kg)
B6I/B8I	16'/21'	3.4	10.2	0.86

4. Comment. Fourth bullet on page 8 of EV's 12/13/91 Public Comment submittal states that "[t]he human health risks associated with the area [lagoon area] fall in the range where USEPA guidance states that action generally is not warranted."

Response. As explained in Comment 1, above, the Hazard Index for the lagoon area soils does exceed one, and therefore does fall within the range of risk where action is warranted.

5. Comment. Top of page 9 of EV's 12/13/91 Public Comment submittal states that "[t]here are many examples of similar sites in USEPA Region V where an effective non-RCRA cap, such as the one proposed by E-V, have been selected by the USEPA in the Records of Decision (RODs) for the site remedy. Among these sites are Kentwood Landfill Superfund Site, the

Michigan Disposal Service Superfund Site, and the Fokertsma Refuse Superfund Site..."

Response. There are a few points which need to be clarified regarding this statement. First, the statement is correct in that the common earth cap which has been proposed by EV for the lagoon area soils does not meet the requirements of RCRA Subtitle C or Subtitle D, nor does it meet the State of Michigan's cap requirements under Michigan's Act 64 and 641. Second the statement is incorrect in that U.S. EPA has never selected a "non-RCRA" cap in any of its Region V RODs. All of the RODs listed above (Kentwood, Michigan Disposal and Fokertsma) called for a cap which meets the requirements of RCRA Subtitle D and Michigan's Act 641, a solid waste cap. The reasons why U.S. EPA has selected a Michigan Act 64 cap for the lagoon area soils is presented in response to comment number 2 in the section entitled "Comments from EV," page 14 of this responsiveness summary.

6. Comment. The first full paragraph on page 13 of EV's 12/13/91 Public Comment submittal states that U.S. EPA's preferred alternative would treat the groundwater with an air stripper.

Response. U.S. EPA's preferred alternative, as identified in the Proposed Plan does not select air stripping as the treatment process for groundwater. The Feasibility Study considered activated carbon, air stripping and chemical oxidation/reduction as viable groundwater treatment technologies (see pages 4-11 and 4-12 of the FS report). At this time, none of these treatment technologies have been chosen to be part of the final remedy. This choice will be made during the remedial design.

7. Comment. In the middle paragraph on page 13 of EV's 12/13/91 Public Comment submittal it states that the EV proposal which calls for monitoring of the off-property groundwater and on-property groundwater treatment will prevent any off-property migration of groundwater contaminants and "will satisfy the criteria of the NCP regarding reduction of volume, mobility and toxicity.

Response. The fourth of the nine evaluation criteria is: reduction of toxicity, mobility, or volume through treatment (emphasis added). See 40 CFR 300.430(e)(iii)(D). This criteria evaluates the degree to which an alternative employs recycling or treatment that reduces toxicity, mobility or volume. Alternatives 4 and 5 in the FS employ a greater degree of treatment since they call for treatment of the off-property groundwater as well as the on-property groundwater. EV's proposal utilizes treatment to a lesser degree because it only contemplates treatment for the on-

property groundwater.

8. Comment. Last paragraph on page 13 of EV's 12/13/91 Public Comment submittal states that the "E-V Alternative is consistent with the EPA Directive on considerations in Ground Water Remediation at Superfund Sites dated October 18, 1989."

Response. The U.S. EPA Directive No. 9355.4-03, Consideration in Ground Water Remediation at Superfund Sites contemplates initiating a groundwater response action early. The directive indicates that a phased groundwater remedial action could be acceptable if initiated early in the remedial investigation/feasibility study (RI/FS) process. EV's alternative for five years of groundwater monitoring, which is not contemplated to start until the remedial design is completed for the on-property source control, is not consistent with the above mentioned Directive. The timing of the EV groundwater monitoring program does not begin early in the RI/FS process, but would begin only after the source has been controlled.

9. Comment. At the top of page 14 of EV's 12/13/91 Public Comment Document, it states that "...the use of natural attenuation and/or institutional controls as a primary ground water remediation remedy has been approved by the USEPA Region V at several sites that are similar to the E-V site. USEPA Region V sites that have reached a Record of Decision that specify the use of natural attenuation and institutional controls as the remedy of choice for groundwater remediation include the Wheeler Pit site in Wisconsin, the Burlington Northern site in Minnesota, the Cliffs-Dow Disposal site in Michigan, and the Charlevoix site also in Michigan."

Response. On January 24, 1992, U.S. EPA met with EV's contractor to discuss these Records of Decisions (RODs). The contractor agreed that since the Burlington Northern ROD was pre-SARA (pre-1986), it was not relevant to the EV site. The contractor, however, did argue that the Charlevoix ROD, which is also a pre-SARA ROD, was relevant to the EV site. Charlevoix, however, can be distinguished from EV for the following reasons: (1) Charlevoix is a pre-SARA ROD, and SARA established U.S. EPA's current groundwater policy, which is to restore usable groundwaters to their beneficial uses whenever practicable; (2) no source of groundwater contamination was located at the Charlevoix site; at EV the source of groundwater contamination has been identified; (3) the aquifer thickness at Charlevoix was approximately 100 feet thick, which means the volume of water that required treatment was significant relative to the volume of water that requires treatment at EV where the aquifer is 50 feet

at the EV property, but narrows down to 10 feet by McCoy Creek; and (4) the cost of the pump and treat at Charlevoix was estimated to be $4.8 million, while the EV pump and treat is estimated to cost $1.6 million.

At the Cliffs-Dow Dump site, there was no unacceptable risk from the groundwater, which is why no active remediation was required. At Cliffs-Dow the risk due to groundwater was estimated to be 3.3X10-6, which is outside the U.S. EPA's risk range of 1X10-4 and 1X10-6. At the EV site, the groundwater poses a significant risk to human health and the environment. The carcinogenic risk associated with future residential use is calculated to be 4X10-4.

At the Wheeler Pit site, for reasons including the fact that there were no Maximum Contaminant Level (MCL) exceedences in the groundwater, no active remediation was required. At the EV site there are MCL exceedences for vinyl chloride, benzene, ethylbenzene, toluene and trichloroethylene.

10. Comment. Bottom of page 14 of EV's 12/13/91 Public Comment submittal. EV argues here that "[t]he absence of current ground-water users and the absence of a usable aquifer suitable for drinking water beneath the E-V site leads to its' proper classification as a Class III (or, at a maximum, a Class II) aquifer."

Response. EV does not explain why the aquifer in the vicinity of the EV site is not suitable for drinking water. The City of Buchanan's municipal wells are located just 4,000 feet west of the EV property and collect water from the same aquifer where the EV contaminant plume is located. The only reason why the aquifer in the area of the EV site may not be usable for drinking water is because of the presence of the EV contaminant plume, which contains concentrations of contaminants at levels above MCLs. This, however, would not classify the aquifer as being unusable as drinking water.

11. Comment. Bottom of page 16 of EV's 12/13/91 Public Comment submittal states that "the additional benefit provided by these McCoy Creek wells [to pump and treat off-property groundwater] as proposed by USEPA is negligible."

Response. U.S. EPA disagrees with this statement. The off-property groundwater contains contaminant levels above MCLs and poses a significant risk to human health and the environment in a future residential use scenario. The NCP states a preference for active restoration of groundwaters to their beneficial uses. U.S. EPA has consistently applied an aggressive cleanup policy regarding groundwater contamination in Region V in order to protect this very

valuable national resource.

12. Comment. Page 19 of EV's 12/13/91 Public Comment submittal states that "[t]he E-V Alternative contemplates fast-tracking the lagoon capping portion of the proposed remedy independent of the other parts of the overall site approach. This can be done only if agreement is reached on E-V's proposal."

    Response. It is not clear why EV cannot accelerate the capping of the lagoon area soils if the EV "common earth" cap is not accepted by U.S. EPA. No reason is given in the text, but it appears that EV is making a statement regarding the amount of cooperation they will afford U.S. EPA in cleaning up the site if U.S. EPA does not accept their final remedy proposal.

Comments received late from EV

1. Comment. Page 4 of EV's Proposed Soil Cover Details dated 1/10/92, states that "[o]f these elements, only arsenic is found above the MDNR Act 307 Type B cleanup level for soil (see below)." A table of the MDNR Type B criteria is listed directly below this statement on page 4.

   Response. The MDNR Act 307 Type B criteria listed in the table on page 4 of EV's Proposed Soil Cover Details dated 1/10/92 are not the aquifer protection criteria which will be required to be met at the EV site. The Type B aquifer protection cleanup standards are: 60 mg/kg for lead, 70 mg/kg for cadmium and 0.50 mg/kg for arsenic. The statement that only arsenic exceeds these cleanup standards is incorrect. As is clear from the Table below, all of the contaminants of concern in the lagoon area soils exceed Michigan's Act 307 Type B cleanup standards.

Element	Lagoon Area Maximum Concentration (mg/kg)	MDNR Type B Standards (aquifer protection) (mg/kg)
Lead	83	60
Cadmium	735	70
Arsenic	14	0.5

2. Comment. Page 4 of EV's Proposed Soil Cover Details dated 1/10/92 states that the average background level for arsenic is 6.8 mg/kg.

Response. The average background level stated above is a regional background level. It is important to note that the average site background level for arsenic is 3.4 mg/kg.

3. Comment. Page 4 of EV's Proposed Soil Cover Details dated 1/10/92 states the "...maximum concentrations for all three of the elements listed above [lead, cadmium and arsenic] were all found in samples located well below the surface of the lagoon area (i.e., outside of any current possibility of human contact). Surface soil concentrations were significantly lower..."

Response. These statements are generally not true. The maximum concentration of lead was detected in sample number SL1-2I, which was taken from a depth of 3.5 - 4.5 feet below the surface, and the cadmium level in this sample was 233 mg/kg, which is on the same order of magnitude as the highest concentration detected for cadmium. The maximum concentration of cadmium was located in sample number 91388NL23 from a depth of 6 - 8.5 feet below the surface. The maximum level of arsenic was located in sample number SL2-6I from a depth of 21 - 23.5 feet below the surface, however, sample number SL2-4I from a depth of 8.5 - 11 feet showed levels of arsenic at 12 mg/kg, only 2 mg/kg less than the maximum.

Additionally, the statement that surface soil concentrations were significantly lower is inaccurate. The maximum surface soil concentrations were as follows:

Lead	57.0 mg/kg
Cadmium	450.0 mg/kg
Arsenic	6.7 mg/kg

None of these surface soil concentrations are "significantly" lower than concentrations in the subsurface soils, all are within the same order of magnitude as the maximum subsurface soil concentrations.

4. Comment. Figure 2 of EV's Proposed Soil Cover Details dated 1/10/92 indicates the proposed cap would consist of 2 feet of common earth with 3 inches of topsoil on top.

Response. The common earth cap which EV proposes is very similar to the former Michigan's Act 87 cap which has been subsequently replaced by Michigan's Act 641 cap. This cap is used for closure of solid wastes and requires a minimum of two feet of compacted clay followed by a minimum of four inches of topsoil and a frost protection layer. The former Act 87 cap was replaced by the Act 641 cap because the Act 87 cap was only designed to last two years. U.S. EPA is concerned with protecting the public from direct contact with the lagoon area soils for a long period of time. A cap which is designed to last only two years is not adequate for long-term protection of human health and the environment.

Additionally, the cap EV proposes does not include a freeze-thaw layer, which in south-western Michigan is necessary because of the cold weather in the winter. Also, the cap that EV proposes will not keep any infiltration out of the lagoon area soils. Cadmium, which was detected at elevated levels as deep as 26 feet below the surface (the groundwater table is at a depth of 29.5 feet), is one of the more mobile metals, and it is conceivable that the cadmium in these soils could reach the groundwater table. Therefore in order to protect the groundwater from leaching of the contaminants in the lagoon area soils, an impermeable cap is necessary.